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Firm Turnover and Productivity Growth in Selected Canadian Services Industries, 2000 to 2007

by John Baldwin and Amélie Lafrance

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- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- ^p preliminary
- ^r revised
- ^x suppressed to meet the confidentiality requirements of the Statistics Act
- ^E use with caution
- F too unreliable to be published
- * significantly different from reference category ($p < 0.05$)

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Abstract

The nature of the competitive process that causes a reallocation of market shares within an industry contributes to aggregate productivity growth. This paper extends our understanding of industry differences in the competitive process by examining firm turnover and productivity growth in various services industries in Canada and situating them relative to retailing and manufacturing, two industries that have been the focus of these studies in the past. Seven industries in the services sector, namely wholesale trade, transportation and warehousing, air transportation, truck transportation, broadcasting and telecommunications, business services and financial services, are examined.

The effectiveness of entry (measured as market share captured) differs considerably more across industries than does its intensity (measured in terms of the percentage of new firms experimenting with entry at any point in time). Business services and truck transportation have the highest effective entry rates. The failure process within entrants is similar across industries, but in industries where entrants are relatively large at birth, the penalty for entry at suboptimal size or productivity is higher. The reallocation process of market share varies across industries, ranging from shifts between incumbents solely in broadcasting and telecommunications, to large gains by entrants at the expense of incumbents in business services and truck transportation. However, firm turnover contributes positively to productivity growth in all industries, with the turnover due to entry and exit being the most important contributor to productivity growth. The industries that most resemble retail in terms of relative importance of entry and its contribution to productivity growth are business services and truck transportation.

Executive summary

The literature on competition has quantified the impact of firm turnover on productivity growth and shown that a substantial portion of productivity growth comes from the competitive process that shifts market share from the less to the more productive.

Most studies have focused on the manufacturing sector and more recently on the Canadian retail trade sector (Baldwin and Gu [2008]; Foster et al. [2006] for the U.S. retail trade sector; Haskel and Khawaja [2003] for the U.K. retail trade sector). Differences in the nature and type of reallocation of market shares in the retail trade and manufacturing sectors reflect basic differences in the nature of competition in the two sectors (Baldwin and Gu 2012).

This paper extends our understanding of industry differences in the competitive process by examining firm turnover and productivity growth in various other services industries in Canada and situating them relative to the retailing and manufacturing sectors. It asks whether there is a general resemblance to one or other of the two models that these two industries exemplify or whether there is a wide spectrum of behaviour exhibited. Seven industries in the services sector, namely wholesale trade, transportation and warehousing, air transportation, truck transportation, broadcasting and telecommunications, business services and financial services, are examined.

The general findings that emerge are the following:

There are fewer differences across industries with respect to exit rates than there are with regard to entry rates. This suggests a pattern of adjustment that is the result of a relatively constant percentage of firms becoming uncompetitive each year and where resources are reallocated to those firms in industries where entry opportunities are most favourable.

The effectiveness of entry (measured as market share captured) differs considerably more across industries than does its intensity (measured in terms of the percentage of new firms experimenting with entry at any point in time).

The effectiveness of entry is closely related to entry conditions that facilitate entry at a relatively large scale and at high relative productivity.

The failure process among entrants (as measured by failure or hazard curves) is similar across industries. The percentage of entrants remaining after six years is about the same in the various services industries. The failure process does differ in terms of the impact of suboptimal size and productivity on the probability of failure. In industries where entrants are relatively large at birth, firms with a smaller relative size or productivity at birth experience a higher failure rate.

Entrants start with a size disadvantage, experience higher failure rates that are inversely proportional to birth size and grow more quickly when they have less of a size disadvantage at birth.

Industries differ in the extent to which incumbents as a group gain market share at the expense of entrants and exiters, but the differences are not large. The entry-and-exit process that replaces less productive exiters with more productive entrants contributes a substantial proportion of overall productivity growth in industries where entry conditions facilitate higher effective entry.

Even when new, more productive entrants are not emerging to replace less productive existing firms that are failing, gains in productivity can occur when restructuring leads to the exit of less productive businesses. Productivity growth comes in some industries from a dynamic growth

process that is characterized by new firms replacing dying, less productive exiters and in other industries from the least productive firms exiting as a result of competition from incumbents.

Turnover within the incumbent sector also contributes to productivity growth, but less so than does entry and exit.

Productivity growth also comes from organic improvements within incumbents—that is, from growth within existing firms. However, this source is not always positive. There are some industries where productivity of an average incumbent falls—perhaps because the industry is adjusting to a decline in demand, or because technology is changing and incumbents are not adapting well.

1 Introduction

Entrants bring fresh competition to an industry. In most industries, these firms will face substantial competition from incumbents who are well established in the industry. Entrants that survive after birth tend to be more productive than the firms they have replaced. The same process takes place within incumbents, as more productive firms take advantage of the cost advantage they possess to compete away market share from the less productive. The reallocation process, whether between incumbents or between entering and exiting firms, contributes to aggregate productivity growth.

The literature on competition has quantified the impact of firm turnover on productivity growth and shown that a substantial portion of productivity growth comes from the competitive process that shifts market share from the less to the more productive.

Existing studies on the relationship between firm dynamics and productivity growth have focused either on one sector, such as the manufacturing sector, or on cross-country comparisons (Scarpetta et al. 2002; Bartelsman et al. 2009). Few studies have carried out cross-industry comparisons. A firm's behaviour is inherently influenced by the competitive pressures in the industry it operates, and these pressures will vary across industries. As a result, the entry process of firms will not be identical in all industries (Pakes and Ericson 1998).

The lack of evidence on industries other than manufacturing is due mainly to the lack of longitudinal data and the difficulty in measuring output in certain sectors, particularly the services sector (Ahn 2000). In spite of these constraints, the increasing importance of the services sector in the economy has led to a growing literature on firm dynamics in this sector. More recently, studies have focused on the retail trade sector (Baldwin and Gu [2008] for the Canadian retail trade sector; Foster et al. [2006] for the U.S. retail trade sector; Haskel and Khawaja [2003] for the U.K. retail trade sector). Differences in the nature and type of reallocation of market shares in the retail trade and manufacturing sectors reflect basic differences in the nature of competition in the two sectors (Baldwin and Gu 2012).

The potential competitive pressures acting on these two very different industries are very similar in that about the same proportion of firms entered and exited both industries. The survival and hazard rates of entrants are also similar. Moreover, there are similarities in the differences in productivity between entrants and the exiting firms that they drove out.

However, while the potential for turnover was the same, its impact was not. The option that retail entrants buy into when they experiment with entry differs from that of entrants to manufacturing in a way that suggests different entry costs in these two industries. Retail entrants start at a larger relative size at birth. This difference in relative entry size gives retail entrants a greater proportional share of output and inputs and leads the turnover process to make a greater contribution to aggregate productivity growth in this industry.

This paper extends understanding of industry differences in the competitive process by examining firm turnover and productivity growth in various other services industries in Canada and situating them relative to the retailing and manufacturing sectors. It asks whether there is a general resemblance to one or the other of the two models that these two industries exemplify, or whether there is a wide spectrum of behaviour exhibited. Seven industries in the services sector, namely wholesale trade, transportation and warehousing, air transportation, truck transportation, broadcasting and telecommunications, business services and financial services, are examined.

A priori, there is reason to believe that entry patterns should differ across services industries. In some industries, such as business services and truck transportation, there is a large number of

small firms and there is substantial firm turnover. Competition in these industries takes place between entrants and incumbents. Other industries, such as broadcasting and telecommunications and financial services, are composed of large firms where entry is less frequent and entrants are less successful. These different industry characteristics may lead to different replacement processes across industries. Therefore, services-producing industries provide us with a unique opportunity to study firm dynamics and their contribution to productivity growth.

The paper is organized as follows. Section 2 describes the data used and provides an industry overview and summary statistics. Section 3 presents empirical evidence on firm turnover in the services industries. Section 4 examines the survival rate of new firms in each industry. Section 5 describes the reallocation process in each industry. Section 6 measures the contribution of firm turnover to productivity growth in the services industries. Section 7 concludes.

2 Data

2.1 Data source

The data for this paper are taken from Statistics Canada's T2-LEAP longitudinal firm-level database, covering the 2000-to-2007 period, which has been modified for this study. This database was created by linking two administrative databases: the Longitudinal Employment Analysis Program (LEAP) and the Corporate Tax Statistical Universal File (T2SUF). LEAP includes all employers in Canada, both incorporated and unincorporated, that register a payroll deduction account with the Canada Revenue Agency (CRA). The database was designed originally to provide longitudinal data on the behaviour of employment levels of Canadian businesses (Baldwin et al. 1992). It contains a longitudinal firm identification number that can be used to examine the amount of entry and exit over time. The file also contains a measure of average employment, called "average labour unit" (ALU), which is calculated as the ratio of total payroll of a firm to average annual wages of the workers in that firm's industry, size class and province.¹ The T2SUF database includes all incorporated firms that filed a T2 tax return with the CRA and provides data on sales, gross profits, equity and assets for all such firms.

A method was developed to match the LEAP and T2SUF files to create a T2-LEAP file that gives measures of output (revenue), capital (assets) and labour (ALU), for *incorporated* firms in Canada. Since employment data in the LEAP file are reported on a calendar-year basis and the year of attribution on the T2 files is set at the end of a fiscal period, the values of financial variables in the T2 files are converted to calendar-year terms in T2-LEAP.

Firm turnover and its effect on productivity in a set of industries in Canada over the 2000-to-2007 period are examined in this paper.² The length of this time period provides us with a reasonable snapshot of firm dynamics in an industry. It is important to have a time period that is longer than one year in order to understand the importance of firm entry and exit rates. The use of too short a time period risks evaluating only the importance of fringe entrants that do not last long enough to have a significant impact on the industry. Short-run entry rates may not reflect the true amount of turnover if most entrants exit shortly after birth. Since hazard rates begin to stabilize after six years (see Section 4), a seven-year time period is chosen here. The industry definitions that are used herein are based on the 1997 North American Industry Classification System (NAICS). The industries that will be examined include wholesale trade, transportation and warehousing (including air and truck transportation), broadcasting and telecommunications, business services, and financial services.

2.2 Industry overview and summary statistics

The services industries covered in this study differ substantially in terms of the number of firms and the conditions that facilitate entry. This section provides a discussion of each industry.

The wholesale trade sector comprises 26 NAICS four-digit industries. In 2000, there were about 48,500 incorporated wholesale firms in the T2-LEAP file. The number of firms remained stable

1. The average annual wages of workers are derived from Statistics Canada's Survey of Employment, Payrolls and Hours (SEPH). For more information on the derivation of ALU, please refer to *T2-LEAP: A longitudinal database of incorporated firms in Canada* (Lafrance and Leung 2009) (unpublished).

2. Since the results in this paper are sensitive to outliers in the database and because the analysis uses mainly end points in the period, the top 5% of firms with the highest levels of labour productivity in the years 2000 and 2007 were removed from the analysis. When one compares the summary statistics resulting from the exclusion of these outliers to the data from capital, labour, energy, materials and services (KLEMS), the results are in fact closer to those observed in KLEMS (see Table 4).

over the period and there were just over 49,000 incorporated firms in the sector in 2007. Similar to the retail trade sector, competition is intense in the wholesale trade sector. New productivity-enhancing technologies have been adopted by this sector since the 1990s, including electronic data interchange. Moreover, the use of warehouses as places to store inventory is declining; warehouses are being replaced with more centralized flow-through distribution centres with automated stock replenishment systems (Cobbold et al. 2000). Among the services-producing sectors, wholesale trade has shown above-average rates of use of services related to information and communications technologies (ICT) (Wölfl 2003).

The transportation and warehousing sector comprises 25 NAICS four-digit industries including air, truck, rail, water, pipeline and public passenger transportation.³ In 2000, there were almost 750 firms in the air transportation industry in the T2-LEAP file. This number decreased over time, and there were approximately 640 firms in 2007. The truck transportation industry has the largest number of firms among the transportation and warehousing sector. There were over 21,000 firms in the T2-LEAP file in 2000, while there were approximately 29,000 in 2007. The remaining transportation and warehousing industries had over 10,000 firms in 2000 and almost 12,000 firms in 2007.

In Canada, water and rail are the most used forms of transport to ship goods. Although truck transportation comes in third, its importance in the overall scheme of freight transportation has grown substantially. From 1990 to 2003, the amount of freight carried by the for-hire trucking industry grew nearly three times faster than all other modes combined (Adams et al. 2006). Entry barriers are quite different between truck, air and all other modes of transportation. For example, entry barriers to the rail industry are typically high; entry to the trucking industry is easier in comparison. The truck transportation industry attracts entrants as a result of its relatively low fixed costs and a lack of brand strength among existing players (Datamonitor, 2008). As for air transportation, although this industry has been deregulated to a certain extent, the large financial outlay involved in setting up a new airline makes entry a challenge.

The telecommunications industry consists of wired or wire line (the largest segment) and wireless telecommunications carriers as well as satellite telecommunications, while the broadcasting industry comprises radio and television broadcasting, as well as pay and specialty television. The number of firms in this industry in the T2-LEAP file has slightly increased over time, from over 1,500 firms in 2000 to over 1,600 firms in 2007. The penetration of telephone service in Canada is among the highest in the world; however, there continues to be a migration from traditional landline telephone service to wireless service among Canadians. Canada also has a high rate of broadband Internet access. These potential opportunities have attracted entrants; however, neither of these industries is devoid of entry barriers. In broadcasting, there is limited availability of licenses, while entry in telecommunications requires significant capital outlay.

Business services (or professional, scientific and technical services as defined in the NAICS) consist of nine NAICS four-digit industries, including computer, advertising, management and engineering services. This sector has experienced the fastest growth in number of firms among the industries being studied. In 2000, there were approximately 78,000 firms in business services in the T2-LEAP file. In 2007, there were approximately 107,000.

The business services sector is an extensive user of ICT and is also involved in research and development (R&D) and innovation activities (Baldwin and Gellatly 2003; Baldwin et al. 1998).

3. Air and truck transportation will be analyzed separately from the transportation and warehousing sector, given the unique entry and exit barriers in each subsector. In this paper, the transportation sector excludes these two subsectors in the analysis.

In 2007, about 30,300 companies were in the ICT sector in Canada. Not all of these fell within business services. However, some 77% of these comprised software and computer services (Industry Canada 2008); these are part of business services. R&D and innovation activities in the services sector have greatly increased in the last 20 years, and business services are believed to be one of the main drivers of technological change and economic progress (Czarnitzki and Spielkamp 2005). As a result of its relatively low barriers to entry, competition is intense in this sector.

The financial services sector also comprises nine NAICS four-digit industries, including credit intermediation, securities exchanges and insurance carriers. In 2000, there were about 26,500 firms in this sector. In 2007, this number reached 28,000. Over time, competition from foreign competitors and non-bank institutions has increased in the Canadian finance sector. Also, Internet banking has quickly expanded, allowing consumers easier access to banking services.

The annual labour productivity growth in the business sector and services industries in Canada, over the 1990-to-2007 period, is presented in Table 1. The broadcasting and telecommunications sector, the wholesale trade sector, and the finance, insurance, real estate and leasing sector all had higher labour productivity growth than the total business sector in Canada during the 1990-to-2007 period (3.9%, 3.1%, and 2.2%, respectively, versus 1.7%). All other industries had positive labour productivity growth.

In the empirical analysis, both labour productivity and multifactor productivity (MFP) are examined.⁴ Labour productivity is a partial measure and is defined here as real value added per worker. The growth in labour productivity may come from the substitution of capital for labour or improvements in overall production efficiency. MFP provides a measure of overall production efficiency and is calculated as real value added per unit of combined capital and labour. It is calculated for each industry as:

$$\ln MFP_{it} = \ln Y_{it} - \alpha_K \ln K_{it} - \alpha_L \ln L_{it}$$

where Y is real value added, K is real capital, L average labour units, the α 's are the cost shares of each input in output, i denotes a firm, and t denotes year.

In this paper, variables from the T2-LEAP file will be used to proxy the variables used in Statistics Canada's official productivity program. Sales will be used instead of gross domestic product or value added. ALUs will be used to proxy employment. Assets will be used to proxy the capital stock that is normally developed from a perpetual inventory model. Capital stock is measured as the value of assets, deflated by the output price index for each industry.⁵ The factor shares are calculated at each industry level and are equal to the average share over the 2000-to-2007 period.⁶

4. In measuring the contribution of firm turnover to productivity growth, only labour productivity will be discussed.

5. While an overall industry price index may not apply to all firms in a particular industry, this is the best available deflator.

6. The income share of labour and capital for each industry are, respectively: wholesale trade—70% and 30%; air transportation—75% and 25%; truck transportation—70% and 30%; transportation and warehousing—70% and 30%; broadcasting and telecommunications—40% and 60%; business services—80% and 20%; financial services—45% and 55%.

Table 1
Annual labour productivity growth in services industries, 1990 to 2007

Industry	Growth rate
	percent
Wholesale trade	3.1
Air transportation	0.8
Truck transportation	1.0
Transportation and warehousing	0.9
Broadcasting and telecommunications	3.9
Business services	1.0
Financial services	2.2
Total, business sector	1.7

Source: Statistics Canada, capital, labour, energy, materials, and services (KLEMS) database.

Data from the two sources show similar variations in the growth rates in labour productivity across most industries, but labour productivity growth is generally higher in all industries when using the KLEMS database. However, the relative rankings of labour productivity across industries that are produced by the T2-LEAP database resemble those from the KLEMS database. In most industries, output and labour increase more rapidly from 2000 to 2007 in the KLEMS database than in T2-LEAP. This is not surprising, since the KLEMS database also includes unincorporated firms, which are present in all industries.

Table 2
Summary statistics for services industries, 2000 to 2007

Industry	Output	Capital	Labour	Labour productivity	Multifactor productivity
			percent		
Wholesale trade	1.7	3.5	0.4	1.3	0.4
Air transportation	5.0	7.4	0.1	4.9	3.1
Truck transportation	2.3	0.6	1.9	0.4	0.8
Transportation and warehousing	1.9	1.7	1.8	0.2	0.9
Broadcasting and telecommunications	0.9	-3.7	-0.4	1.3	-4.2
Business services	4.6	5.2	3.3	1.2	0.8
Financial services	1.5	5.9	1.1	0.4	-2.1

Note: All results show the average percentage growth over the period.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 2 presents summary statistics of changes in output, inputs, labour productivity and MFP in the services industries over the 2000-to-2007 period, as calculated from the data in the T2-LEAP file. The summary statistics for the corresponding industries as calculated in the Canadian KLEMS database are also presented for comparison, in Tables 3 and 4, for the same period. The KLEMS database covers both incorporated and unincorporated firms and uses a slightly different methodology for measuring labour inputs.⁷

7. The official MFP measure has been adjusted for changes in capital and labour quality whereas the ones that are used here are not and therefore should be higher. This is the case for four out of the seven industries examined.

Table 3
Output and labour growth for services industries, 2000 to 2007

Industry	Output		Labour	
	T2-LEAP ³	KLEMS ⁴	T2-LEAP	KLEMS
	percent			
Wholesale trade	1.7	5.0	0.4	1.2
Air transportation	5.0	1.3	0.1	-5.2
Truck transportation	2.3	4.9	1.9	3.9
Transportation and warehousing ¹	1.9	3.0	1.8	2.7
Broadcasting and telecommunications	0.9	4.7	-0.4	0.7
Business services	4.6	3.6	3.3	3.5
Financial services ²	1.5	3.1	1.1	2.8

1. Includes air and truck transportation in KLEMS.

2. Includes real estate and leasing in KLEMS.

3. The Corporate Statistical Universal File (T2SUF) and the Longitudinal Employment Analysis Program (LEAP) database were matched to create the T2-LEAP file.

4. Capital, labour, energy, materials, and services database.

Note: All results show the annual percentage growth over the period.

Sources: Statistics Canada, KLEMS database and Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 4
Labour productivity and multifactor productivity growth for services industries, 2000 to 2007

Industry	Labour productivity		Multifactor productivity	
	T2-LEAP ³	KLEMS ⁴	T2-LEAP	KLEMS
	percent			
Wholesale trade	1.3	4.2	0.4	1.3
Air transportation	4.9	6.9	3.1	1.2
Truck transportation	0.4	1.5	0.8	-0.7
Transportation and warehousing ¹	0.2	1.0	0.9	-0.3
Broadcasting and telecommunications	1.3	3.8	-4.2	2.2
Business services	1.2	0.8	0.8	0.0
Financial services ²	0.4	0.8	-2.1	0.2

1. Includes air and truck transportation in KLEMS.

2. Includes real estate and leasing in KLEMS.

3. The Corporate Tax Statistical Universal File (T2SUF) and the Longitudinal Employment Analysis Program (LEAP) database were matched to create the T2-LEAP file.

4. Capital, labour, energy, materials, and services database.

Note: All results show the annual percentage growth over the period.

Sources: Statistics Canada, KLEMS database and Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

3 Firm turnover in the services industries

Firm turnover occurs as market share is shifted from one firm to another, driven by the competitive process. It can result from the entry and exit of firms. It can also result from the growth and decline of surviving firms (incumbents). This section examines the intensity of firm turnover in services industries in Canada.

3.1 Annual entry and exit rates

Annual entry and exit rates in Table 5 are calculated as the percentage of the total number of firms accounted for by entering and exiting firms averaged over the 2002-to-2007 period. To avoid the problem of partial-year reporting during the birth year of new firms, entrants in year t are defined as firms that were absent in $t-2$, but appeared in $t-1$ and t . Exiting firms are defined in year t as firms that were present in years $t-2$ and $t-1$ but absent in year t .

Table 5

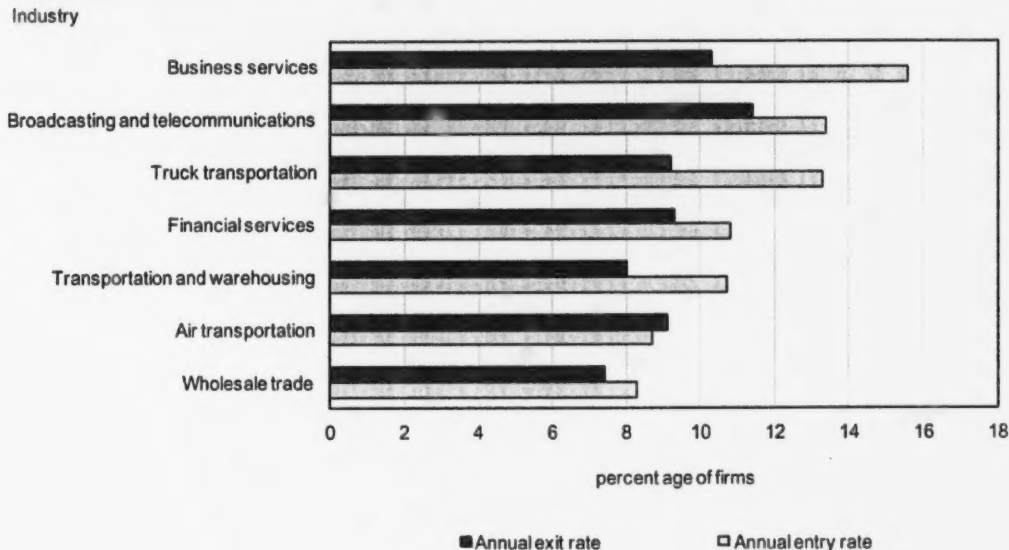
Average annual entry and exit rates, and total turnover for services industries, 2002 to 2007

Industry	Entry rate	Exit rate	Total turnover
		percent	
Wholesale trade	8.3	7.4	15.7
Air transportation	8.7	9.1	17.8
Truck transportation	13.3	9.2	22.5
Transportation and warehousing	10.7	8.0	18.7
Broadcasting and telecommunications	13.4	11.4	24.8
Business services	15.6	10.3	25.9
Financial Services	10.8	9.3	20.1

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Over the 2002-to-2007 period, entry rates were higher than exit rates for all services industries, except air transportation. Entry rates were highest in business services, followed by broadcasting and telecommunications and truck transportation. These industries accounted for about 15.6%, 13.4% and 13.3% of the total number of firms in a year, respectively. Entry costs in business services and truck transportation are lower than those in air transportation. Exit rates range from 7.4% in wholesale trade to over 11% in broadcasting and telecommunications.

The variations in the annual entry and exit rates across industries are plotted in Chart 1. Differences in entry rates across industries are greater than differences in exit rates—though the two rates are positively correlated. Industries with higher entry rates tend to have higher exit rates—partially because new entrants have been found to have a much higher rate of exit (Baldwin et al. 2000). Some industries possess the characteristics that lead more firms to experiment with entry in order to learn about their capabilities (Caves 1998). These industries will naturally exhibit higher rates of exit because more experimentation leads to more exit. Nevertheless, the variation in exit rates is lower than entry—much as has been found from examining time series data (Baldwin and Gorecki 1991). This accords with an explanation that there is a portion of exit in each industry that is relatively constant and that is associated with a general rate of obsolescence of managerial capacity across industries; nevertheless, exit rates can vary from this baseline at a point in time as a result of changes in macroeconomic conditions or at an industry level from pressures arising from a particular need to restructure following shifts in demand or technological changes.

Chart 1**Entry and exit rates for services industries, annual averages, 2002 to 2007**

3.2 Longer-run entry and exit rates

Long-run entry rates capture the cumulative effect of several cohorts of entrants. Long-run entry and exit rates will differ from shorter-run rates for a number of reasons. If entrants die quickly and do not grow, the longer-run rates will be less than simply the sum of the short-run rates. As well, if entrants are merged with larger firms, long-run entry rates will also be low relative to the cumulative sum of the short-run rates.

Long-run entry and exit rates over the 2000-to-2007 period are presented in Table 6. The long-run entry rate is the market share in the final year captured by all firms that are new since the base year (2000). The long-run exit rate is the share of firms in 2000 that exit by 2007. A comparison of the short-run rate, the cumulative short-run rate and the actual long-run rate is provided in Chart 2.

Wholesale trade is characterized by the lowest entry plus exit rates. Air transport comes second. There is substantial firm turnover in truck transportation, broadcasting and telecommunications, and business services, where firms that entered the industry during the 2000-to-2007 period make up a large proportion of the total number of firms—more than half of firms for all three industries. Entering firms in business services are particularly important in that they account for 30% of total sales and for 29% of employment.

Table 6
Firm turnover in services industries, 2000 to 2007

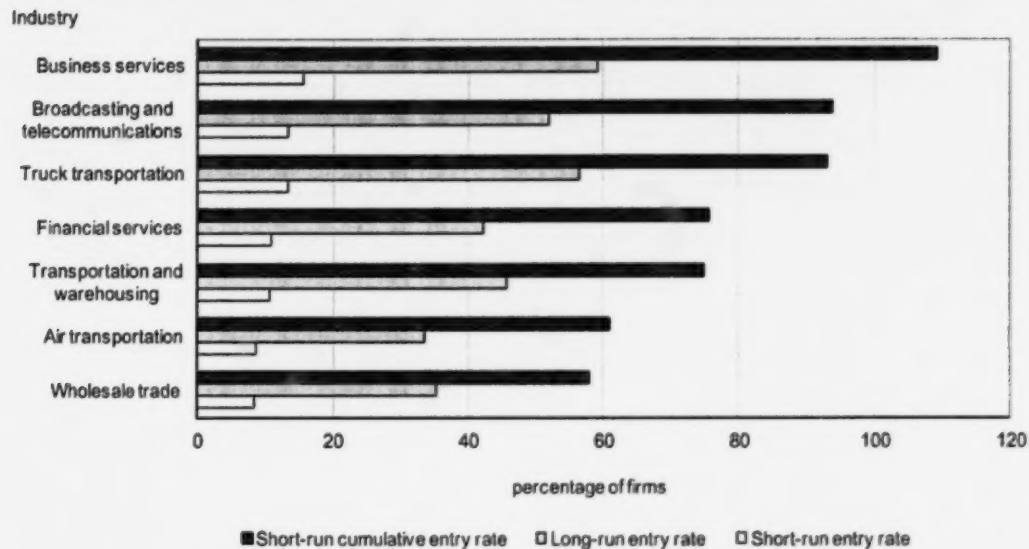
Industry	Total firms	Share of firms	Share of sales	Share of average labour units	Share of assets
	number		percent		
Wholesale trade					
Surviving firms	29,678	...	...	...	...
Entering firms	16,216	35.3	9.9	10.9	8.6
Exiting firms	15,839	34.8	10.0	13.2	9.1
Air transportation					
Surviving firms	417	...	...	...	...
Entering firms	210	33.5	7.1	5.3	2.1
Exiting firms	276	39.8	9.3	7.7	5.1
Truck transportation					
Surviving firms	11,790	...	...	...	...
Entering firms	15,386	56.6	22.8	20.3	16.8
Exiting firms	8,017	40.5	18.4	19.6	15.7
Transportation and warehousing					
Surviving firms	6,000	...	...	...	...
Entering firms	5,045	45.7	8.6	8.2	4.1
Exiting firms	3,464	36.6	6.8	6.9	2.8
Broadcasting and telecommunications					
Surviving firms	738	...	...	...	...
Entering firms	799	52.0	2.4	5.1	0.6
Exiting firms	692	48.4	2.7	7.4	2.2
Business services					
Surviving firms	41,062	...	...	...	...
Entering firms	59,488	59.2	29.6	28.8	26.8
Exiting firms	31,541	43.4	19.2	20.9	20.2
Financial services					
Surviving firms	15,157	...	...	...	...
Entering firms	11,068	42.2	4.9	9.3	2.2
Exiting firms	9,608	38.8	10.3	17.1	3.6

Notes: Authors' calculations from T2-LEAP file. The employment share (average labour units) of entering and exiting firms is calculated as the share over total employment of these firms plus continuing firms, whereas the employment of continuing firms is the average value over the start and end years of a period. The share of sales and assets is calculated similarly.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

The ranking of the industries is similar, whether the short- or the long-run entry rates are used (Chart 2). The list, in order from the lowest to the highest short-run entry rates, is the following: wholesale trade, air transportation, transportation and warehousing, financial services, truck transportation, broadcasting and telecommunications, and business services. The differences across the categories from lowest to highest are less for the long-run entry rate, thereby indicating that there is a higher cumulative exit for the industries with the highest short-run entry rates. While there may be a base failure rate that is similar across all industries, the degree of experimentation with entry is higher in some industries and this factor augments the base exit rate in these industries.

Chart 2
Short- and long-run entry rates for services industries, 2000 to 2007

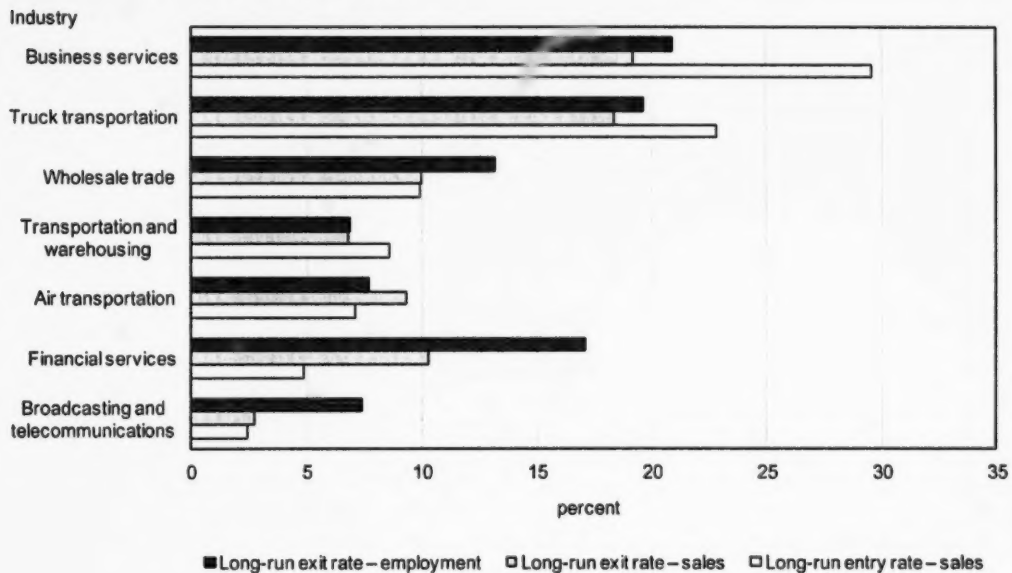


As noted earlier, differences across industries in entry rates are often greater than in exit rates—because the latter process is associated with ongoing deterioration that takes place whether or not new opportunities are bringing entrants into the industry.

The long-run exit rates that are plotted side by side with the long-run entry rates in Chart 3 demonstrate that two industries (broadcasting and telecommunications and financial services) have relatively high exit rates, compared to entry, during our study period. Moreover, the exit rates when measured in terms of employment are even higher than when measured in terms of sales. Exiters in these industries were relatively less productive than in other industries, suggesting an adaptation process that eliminated the relatively less efficient firms in these industries.

Chart 3

**Long-run entry rates and long-run exit rates (sales and employment)
for services industries, 2000 to 2007**



3.3 Relative productivity of entrants and exiters

The entry-and-exit process sees new firms entering each industry at very different sizes and levels of relative productivity. In some industries, the new firms are more productive than incumbents. In others, they lag behind incumbents. The annual mean ratio of the productivity of entrants and exiters to that of incumbents is presented in Table 7.

Table 7**Labour productivity, multifactor productivity and size of entering, exiting and surviving firms in services industries, 2002 to 2007**

Industry	Entering firms	Surviving firms	Exiting firms
	percent		
Wholesale trade			
Labour productivity	70.5	100	50.7
Multifactor productivity	83.1	100	62.1
Real output	32.2	100	17.9
Air transportation			
Labour productivity	54.8	100	85.7
Multifactor productivity	68.5	100	132.5
Real output	34.8	100	21.3
Truck transportation			
Labour productivity	104.4	100	87.3
Multifactor productivity	116.9	100	96.0
Real output	51.8	100	35.5
Transportation and warehousing			
Labour productivity	112.5	100	112.1
Multifactor productivity	142.1	100	142.5
Real output	51.8	100	35.5
Broadcasting and telecommunications			
Labour productivity	25.4	100	31.6
Multifactor productivity	164.6	100	113.6
Real output	32.2	100	24.5
Business services			
Labour productivity	109.2	100	73.7
Multifactor productivity	111.4	100	75.7
Real output	59.8	100	29.4
Financial services			
Labour productivity	46.3	100	41.9
Multifactor productivity	146.2	100	99.4
Real output	45.3	100	32.0

Notes: Results are annual averages for the 2002-to-2007 period, with survivors normalized to 100. Labour productivity and multifactor productivity are weighted by the average labour units.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

This table contains annual averages over the 2002-to-2007 period of labour productivity, MFP and the size (represented by real output) of entering, exiting and surviving firms for the services industries, with survivors normalized to 100. Labour productivity and MFP are all weighted by employment in order to account for the size of the firm.

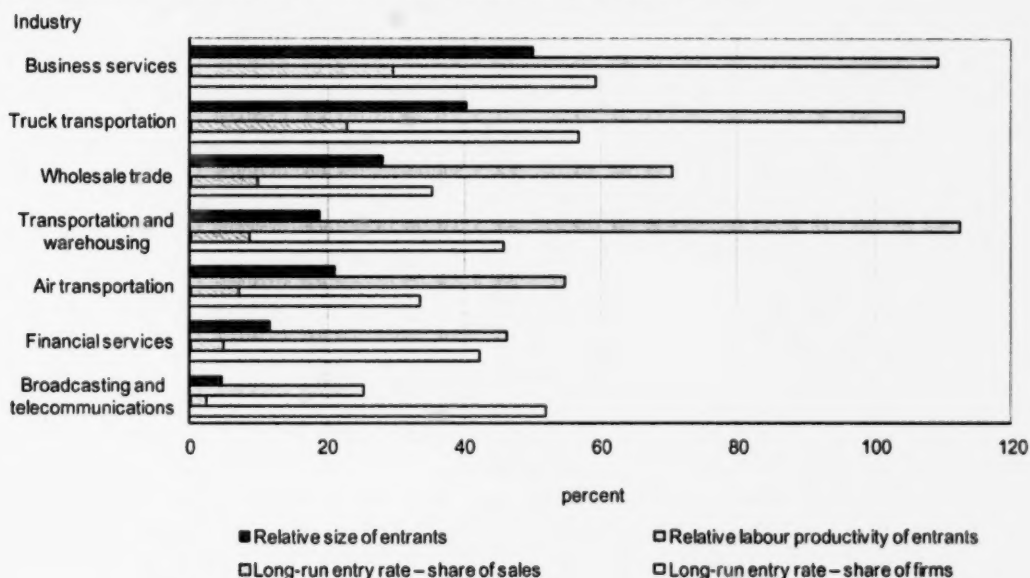
While the labour productivity and MFP of some entrants are as large as those of incumbents in their industry, entrants are, on average, much smaller in terms of real output or sales. The sales of entering firms are, on average, about 40% those of surviving firms. Entrants in business services have particularly high sales, equaling almost 60% those of surviving firms in the industry. On the basis of sales, entrants tend to be relatively larger than exiters.

The differences in relative size and relative productivity across industries are plotted in Chart 4. Industries with relatively more entry are those where relative size in the year of entry is larger.

The cross-industry differences in relative size of entrants serve to make industry differences in the entry rate, when measured by share of sales, greater than when measured in terms of the percentage of firms accounted for by new entrants. The industry with the highest entry rate as calculated using the percentage of new firms is only 76% higher than the lowest, but the corresponding ratio is over 1200% when entry is measured using the share of sales captured. As a result, the intensity of new entrants, as measured by the relative number of firms experimenting with entry, varies across industries much less than the revealed effectiveness of entrants, as measured by the amount of market share they capture.

Chart 4

Long-run entry rates (sales and firms), and relative size and labour productivity of entrants in services industries, 2000 to 2007



The entry decision requires a tradeoff between the cost disadvantage of suboptimal entry (entry below minimum efficient size of plant) and the costs of failure (due to the loss of fixed or sunk capital). The differences in these conditions across industries lead to variations in entry size. Furthermore, this variance, along with the differences in the firm entry rate defined in terms of the percentage of new firms, creates large variations in the effective rate of entry as measured by the share of sales or employment accounted for by entrants.

Differences in the firm entry rate also affect differences in the impact of entry on industry productivity since differences in relative size are reflected in differences in relative productivity (Chart 4).

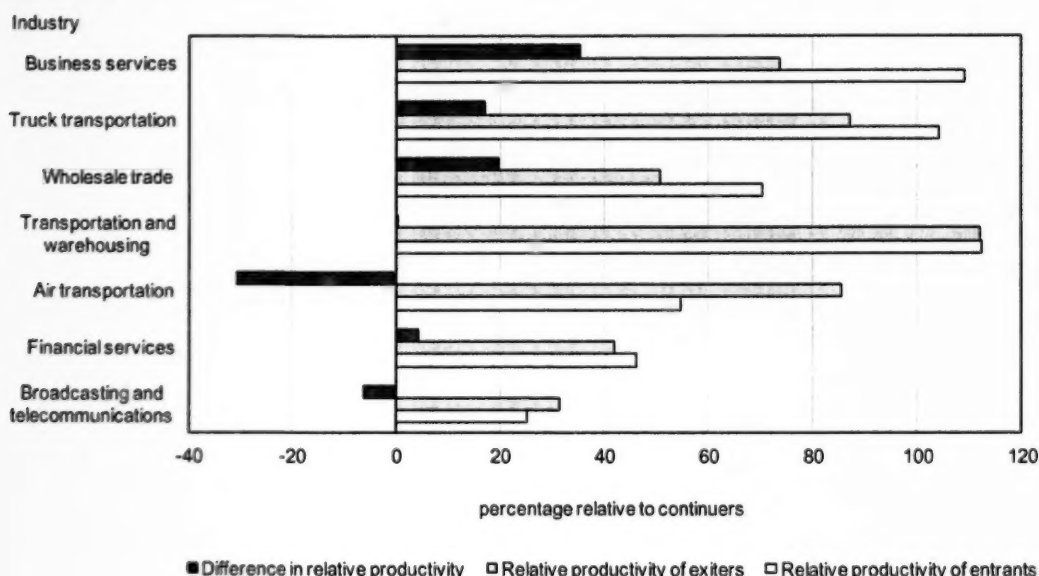
In wholesale trade, truck transportation and business services, entering firms had higher labour productivity than the firms that exited over the 2002-to-2007 period (Chart 5). In business services, the labour productivity of entrants was over 35% higher than that of exiters over the same period. By way of contrast, in air transportation, where exit rates are higher than entry rates, exiting firms were more productive than entering firms.

In truck transportation, transportation and warehousing and business services, entrants were also more productive than surviving firms. In broadcasting and telecommunications, and financial services, entrants were more productive than surviving firms in terms of MFP.

The industries where entry was highest were characterized by both relatively high productivity and positive differences between the relative productivity of entrants and exiters. These are the industries where replacement of exiters with more productive entrants would have contributed to overall productivity growth.

In contrast, in those industries with relatively lower entry rates, there was no positive difference generally between the relative productivity of entrants and exiters. In fact, the opposite was the case for several of these services industries, or there was no significant difference between the two. These are industries where it is difficult to envisage new firms being able to replace exiters given their relative efficiency (as measured by relative productivity).

Chart 5
Relative productivity of entrants and exiters in services industries,
2000 to 2007



4 Survival, failure and post-entry performance in the services industries

The previous section examined differences across industries in the intensity of entry and exit. More similarities were found in the intensity of entry (as measured by the percentage of entities that are constantly being born) than in their effect (as measured by the share of sales that the new entrants have captured—as a result of differences in the relative size of firms at birth). Industries where entrants are able to achieve relatively larger plant size are those where entrants as a group gain a larger market share.

The ultimate importance of an entry cohort depends on the size of an initial cohort at birth, its post-natal death rate and its rate of post-natal growth. This section investigates differences in post-entry failure rates and the growth rates of surviving entrants across services industries.⁸

It first asks whether the rate of exit of new entrants tends to differ dramatically across industries—this is for the purpose of investigating whether there are inherent barriers to exit or whether entry is relatively more successful in some industries than in others. It also focuses on whether relative plant size and relative productivity of entrants affect the rate of exit. It asks whether the impact of size at birth is ubiquitous—or restricted to those industries where entrants do not establish an early presence at any significant plant size. It then focuses on the nature of the post-natal growth phase of an entry cohort—by asking how rapid the growth is and what type of plant grows most rapidly.

Differences in survival rates speak to whether the entry environment in some industries is more conducive to success than that in others. Differences in post-entry industry productivity growth speak to the type of learning process that entrants undergo and thus to their potential contribution to overall productivity growth.

4.1 Post-entry survival

The post-entry survival profile of new firms in the Canadian services industries is investigated using the Cox partial likelihood proportional hazards model. This regression model makes no assumption about the shape of the hazard function over time. The hazard rate of firm i is denoted by $h_i(t)$, defined as the probability that the firm exits in interval t to $t+1$, conditional upon having survived until period t . The hazard rate of a firm is estimated as a function of labour productivity and multifactor productivity (MFP) in log relative to average industry levels, individual firm size relative to average firm size, and a set of binary variables for four-digit industries and year cohorts:

$$h_i(t) = h_0(t) \exp[\alpha_1 relprod_i + \alpha_2 relsize_i + \alpha_3 industry_i] \quad (1)$$

where $h_0(t)$ is the baseline hazard; $relprod_i$ is initial productivity, calculated separately as labour or MFP, of firm i relative to the respective average industry levels; $relsize_i$ is initial employment in log form relative to the average firm size of the respective industry; and the binary variables represent different cohorts and industries. Since variables $relprod_i$ and $relsize_i$,

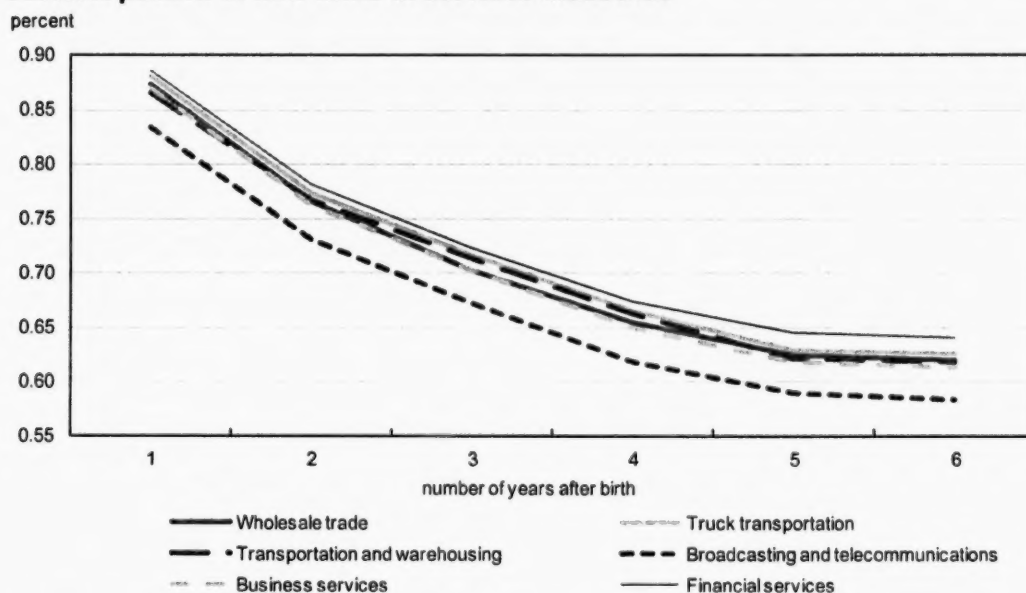
8. In this section, air transportation will not be examined.

are measured as deviations from means, the baseline hazard can be interpreted as the hazard for the mean firm.

This model is estimated for all services industries, on the basis of all cohorts of firms born from 2002 to 2005. The estimation technique allows for censoring since the lifetime of entrants that survived until 2007 is right-censored.

Before the regression results are presented (below), the Kaplan-Meier survival curve is plotted for each industry in Chart 6 for all firms born from 2002 to 2005. The pattern of survival of new firms in transportation and warehousing, wholesale trade, and business services industries, is very similar. The exit rate of new firms is highest in broadcasting and telecommunications where the entry rate is lowest. A quarter of entrants in broadcasting and telecommunications exit during the three years after a firm's birth and only 58% of entrants survive until the sixth year. The proportion for most of the other industries is only slightly higher—with between 61% and 62% remaining in the sixth year. Differences across the survival profiles are small.

Chart 6
Survival pattern of new firms in services industries



Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

The regression results from Equation (1) for labour productivity are presented in Table 8. Industries are ranked from left to right by the long-run entry rate calculated using the share of sales. Industries with higher long-run entry rates are also those where entrants are relatively more productive and larger at birth. Appendix Table A.1 presents the results for MFP.

In all industries, the coefficients on relative labour productivity are negative and statistically significant at the 1% level. Entrants with high labour productivity are more likely to survive. In each industry, a 10-percentage-point increase in labour productivity at birth is associated with

an increase of 1 to 2 percentage points in the survival rate.⁹ The coefficients on relative labour productivity are similar for business services, truck transportation, wholesale trade, and broadcasting and telecommunications, but lower for transportation and warehousing and financial services. Generally, industries that are characterized by a relatively high productivity of entrants are those with a higher penalty for not achieving high productivity at birth.

Size at birth also has an impact on firm survival in all industries. A 10-percentage-point increase in employment size has a similar effect in wholesale trade, business services, transportation and warehousing, and truck transportation—increases of 4.5, 4.4, 4.1, and 3.9 percentage points in the survival rate, respectively. Size is also positively related to firm survival in broadcasting and telecommunications, and financial services, where a 10-percentage-point increase in employment size is associated with a slightly lower impact on survival—an increase of 2.9 percentage points and 2.7 percentage points in firm survival, respectively.

Achieving higher plant size is a primary determinant behind the overall success of an entry cohort. In addition, these results indicate that the impact of not doing so is generally larger in terms of exit rates after birth for those industries where entrants achieve the largest post-entry size, on average.

The coefficients on the binary variables for different entry cohorts are negative and decreasing across each cohort for all industries, except for transportation and warehousing, financial services and broadcasting and telecommunications in 2005. Firms entering towards the end of the period (an expansionary period following the 2000–2001 recession) had the lowest exit hazard rates.

The baseline hazard for average entrants born in 2002 that is derived from Equation (1) is plotted in Chart 7.¹⁰ In all industries, the exit hazard rate decreases over time, except in the first year for all industries other than broadcasting and telecommunications and transportation and warehousing. This indicates that the risk of failure increases in the first year—as it does for retail trade (Baldwin and Gu 2008). Cross-industry differences are just the inverse of the survival results: the highest hazard function is in broadcasting and telecommunications, and the lowest is in transportation and warehousing. The functions tend to converge over time. While there are small differences across industries for young firms, as time goes by, firms in all industries master the basics that they require in order to survive (see Baldwin et al. 1997) and begin to increasingly resemble one another, at least with respect to their failure rates.

9. There is more variation in the impact of relative MFP, probably because this variable is subject to more measurement error.

10. The omitted categories for the industry binary variables in wholesale trade, transportation and warehousing, broadcasting and telecommunications, business services and financial services are the following: food products (wholesale); freight transportation arrangement; wired telecommunications carriers; management, scientific and technical consulting services; other financial investment activities, respectively.

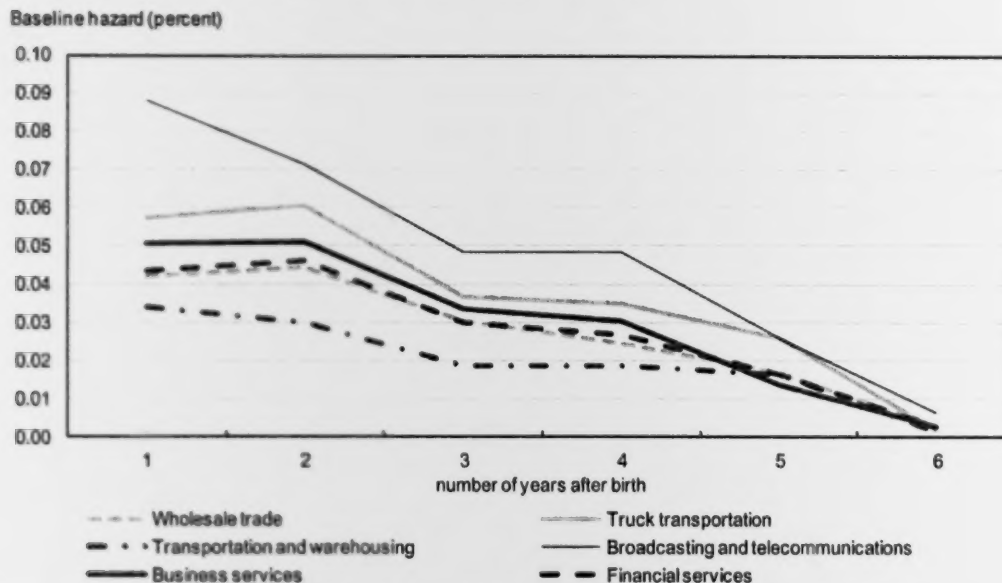
Table 8
Hazard rate of firm exits in services industries, regression results

Variable	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Employment in log	-0.290	7.200	-0.270	20.210	-0.410	16.770	-0.450	36.560	-0.390	21.390	-0.440	61.620
Relative labour productivity in log	-0.161	3.390	-0.080	5.220	-0.08	3.280	-0.150	14.220	-0.120	6.060	-0.190	28.130
Binary variables for entry cohort												
2003	-0.140	0.960	-0.080	1.780	-0.220	3.260	-0.090	2.610	-0.140	3.070	-0.110	5.530
2004	-0.440	2.660	-0.160	3.410	-0.290	3.960	-0.210	5.650	-0.180	3.830	-0.150	0.150
2005	-0.320	1.920	-0.110	2.370	-0.240	3.270	-0.250	6.460	-0.230	4.870	-0.230	10.660
<hr/>												
	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
Diagnostic statistic												
Number of observations		671		9,515		3,834		14,355		9,678		44,716
Log likelihood		-1,558		-27,331		-10,369		-45,760		-28,679		-161,445

Note: All regressions control for fixed effects for industries at the four-digit level of the North American Industry Classification System.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Chart 7
Baseline hazard of new firms in services industries



Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

4.2 Post-entry performance

A regression that relates *relative* firm performance to binary variables for the age of the entrants, cohort binary variables and industry binary variables is used to examine post-entry performance:

$$\ln Y_{it} = \alpha_1 + \alpha_2 \text{Age}_{it} + \alpha_3 \text{Industry}_i + \alpha_4 \text{Cohort}_i + \varepsilon_{it} \quad (2)$$

where Y_{it} represents various measures of the performance of firm i in period t , such as labour productivity, MFP and output, all measured relative to their respective industry averages. This specification is estimated for all cohorts of new firms born from 2002 to 2005 that survived until 2007. Equation (2) is estimated using both unweighted ordinary least squares (OLS) and weighted least squares (WLS) regression techniques. The results from OLS represent the post-entry performance of an average entering firm relative to the industry average, while the results from WLS provide a picture of the performance of all entrants in a cohort group as a whole. The latter takes into account relative firm size.

Table 9

Post-entry growth in relative labour productivity of new firms in services industries—using ordinary least squares

Variable	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Binary variables for the age of new firms												
1 year	...	...	...	...	...	...	...	...	...	...	...	...
2 years	-0.032	0.420	-0.016	0.820	-0.032	1.150	-0.020	1.270	0.008	0.580	-0.009	1.250
3 years	-0.054	0.700	-0.053	2.700	-0.039	1.400	-0.031	2.040	0.011	0.760	-0.010	1.430
4 years	-0.041	0.510	-0.059	2.680	-0.035	1.120	-0.024	1.430	0.011	0.730	-0.006	0.780
5 years	-0.054	0.580	-0.078	3.060	-0.065	1.660	-0.046	2.360	0.005	0.290	0.001	0.090
6 years	-0.100	0.900	-0.118	3.570	-0.074	1.710	-0.093	3.670	-0.036	1.590	-0.010	0.820
	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
Relative labour productivity growth ratio at birth ¹	0.254		0.463		1.125		0.705		1.044		1.092	
Diagnostic statistics												
Number of observations	1,811		27,549		10,937		40,904		27,432		124,894	
R squared	0.13		0.02		0.2		0.03		0.001		0.03	

1. These results are also shown in Table 7.

Notes: All regressions control for fixed effects for industries at the four-digit level of the North American Industry Classification System and entry cohort. The weighted regression for labour productivity uses average labour units as weights, and the weighted regression for multifactor productivity uses sales as weights.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 10

Post-entry growth in relative labour productivity of new firms in services industries—using weighted least squares

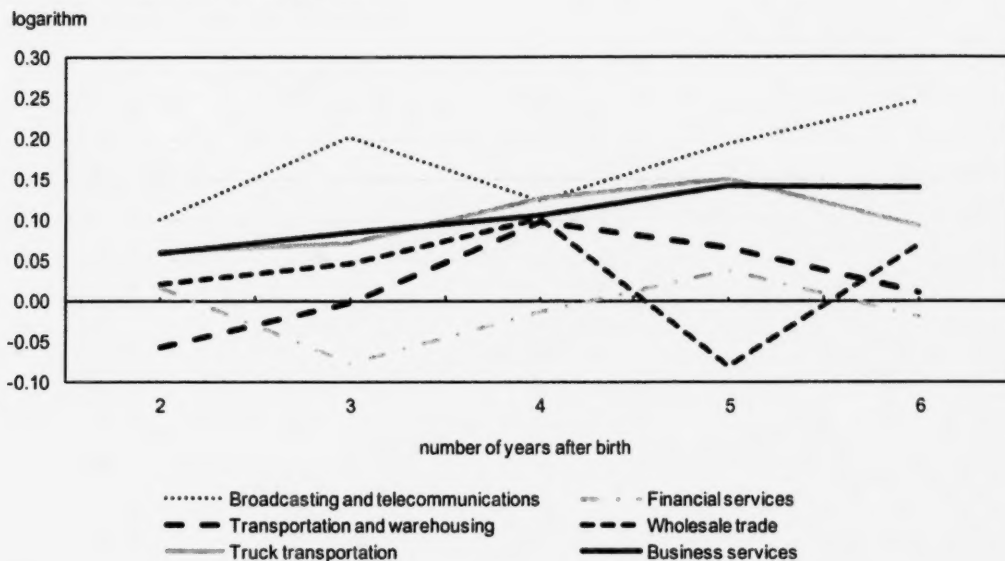
Variable	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Binary variables for the age of new firms												
1 year	...	...	...	...	...	...	...	...	...	...	...	...
2 years	0.100	0.530	0.016	0.090	-0.057	0.520	0.021	0.520	0.062	1.180	0.059	1.020
3 years	0.202	1.120	-0.077	0.370	-0.003	0.030	0.047	1.100	0.073	1.630	0.085	1.630
4 years	0.125	0.780	-0.012	0.050	0.097	0.840	0.102	2.330	0.127	2.530	0.106	2.100
5 years	0.194	1.100	0.038	0.150	0.065	0.480	-0.080	0.510	0.151	2.590	0.142	2.800
6 years	0.246	1.160	-0.020	0.060	0.011	0.090	0.069	1.040	0.094	1.180	0.140	2.420
	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
Diagnostic statistic												
Number of observations	1,811		27,549		10,937		40,904		27,432		124,894	
R squared	0.15		0.29		0.18		0.09		0.004		0.05	

Notes: All regressions control for fixed effects for industries at the four-digit level of the North American Industry Classification System and entry cohort. The weighted regression for labour productivity uses average labour units as weights, and the weighted regression for multifactor productivity uses sales as weights.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Chart 8

Post-entry growth in labour productivity of new firms in services industries, using weighted least squares



Tables 9 and 10 contain the OLS and WLS regression results for labour productivity growth of new firms in the Canadian services industries. The results for MFP are presented in Appendix Tables A.2 and A.3. The WLS results for labour productivity growth are graphed in Chart 8. Also shown in the OLS results (Table 9 and Table A.2) is the labour productivity of entrants at birth relative to that of incumbents.

In all industries, the average entrant has negative or zero productivity growth following birth. The results using WLS show there is growth in the overall cohort for those industries where entry is highest—in truck transportation and business services. Elsewhere, it is either negative or not significant.

In summary, in most of the services industries, there is little catch-up in productivity after birth. These industries then follow the model found earlier in the retail sector (Baldwin and Gu 2008).

Table 11

Post-entry growth in relative output of new firms in services industries—using ordinary least squares

Variable	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Binary variables for the age of new firms												
1 year	...	...	...	...	...	...	...	...	...	...	...	...
2 years	0.228	2.160	0.113	4.290	0.124	3.310	0.126	5.990	0.111	5.720	0.092	9.840
3 years	0.231	2.060	0.141	5.330	0.142	3.750	0.145	6.790	0.139	7.020	0.107	11.100
4 years	0.281	2.260	0.168	5.560	0.191	4.320	0.162	6.610	0.188	7.950	0.133	11.850
5 years	0.289	1.830	0.186	5.160	0.184	3.310	0.153	5.260	0.197	6.960	0.135	9.980
6 years	0.177	0.790	0.155	3.160	0.115	1.590	0.110	2.770	0.144	3.690	0.093	4.980
	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
Relative labour productivity growth rate at birth ¹	0.322		0.453		0.518		0.322		0.518		0.598	
Diagnostic statistic												
Number of observations	1,811		27,549		10,937		40,904		27,432		124,894	
R squared	0.08		0.07		0.11		0.04		0.02		0.04	

1. These results are also shown in Table 7.

Notes: All regressions control for fixed effects for industries at the four-digit level of the North American Industry Classification System and entry cohort. The weighted regression for labour productivity uses average labour units as weights, and the weighted regression for multifactor productivity uses sales as weights.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

4.3 Post-entry growth in relative output

Table 11 contains the results for post-entry growth in relative output among new firms in the services industries, using the unweighted regression (OLS). The relative plant size of entrants at birth is also shown. Appendix Table A.4 contains the results from a weighted regression (WLS), using output as weights. The results from the unweighted regression indicate that in most industries, relative output of an average entering firm increases during the first five years of its life. Relative output growth of an average entering firm in broadcasting and telecommunications is especially high.

The results from the weighted regression allow us to track the post-entry growth in output among surviving members of the entering cohort as a group. Except in truck transportation, and transportation and warehousing, the growth in output for the surviving cohort relative to the industry average is larger than the growth of an average entering firm. Large entrants tend to have higher growth in output in most industries. Entrants therefore generally start with a size disadvantage, experience higher failure rates that are inversely proportional to birth size and grow more quickly when they have less of a size disadvantage at birth.

5 Setting entry and exit in context

The importance of entry and exit needs to be placed in the context of the competitive forces that are affecting continuers in each industry. This is done in this section by comparing gains and losses in market share of entrants and exiters to the gains and losses in market share within existing firms.

The size of the shifts that occurred in market share being transferred from exiters and incumbents that lost market share to entrants and incumbents that gained market share over the 2000-to-2007 period is presented in Table 12.

Table 12
Shifts in market share in services industries, 2000 to 2007

	2000	2007	Change	Total turnover
	percent			absolute value
Wholesale trade				
Surviving firms	89.4	90.6	1.2	41.8
Market-share gaining continuers	38.8	60.3	21.5	...
Market-share losing continuers	50.6	30.3	-20.3	...
Entering and Exiting firms				20.0
Entering firms	...	9.4	9.4	...
Exiting firms	10.6	...	-10.6	...
Air transportation				
Surviving firms	88.6	94.1	5.5	16.6
Market-share gaining continuers	...	...	...	...
Market-share losing continuers	...	...	...	...
Entering and Exiting firms				17.4
Entering firms	...	6.0	6.0	...
Exiting firms	11.4	...	-11.4	...
Truck transportation				
Surviving firms	80.6	78.4	-2.2	40.8
Market-share gaining continuers	33.2	52.5	19.3	...
Market-share losing continuers	47.4	25.9	-21.5	...
Entering and Exiting firms				41.0
Entering firms	...	21.6	21.6	...
Exiting firms	19.4	...	-19.4	...
Transportation and warehousing				
Surviving firms	92.8	91.9	-0.9	31.5
Market-share gaining continuers	34.3	49.6	15.3	...
Market-share losing continuers	58.5	42.3	-16.2	...
Entering and Exiting firms				
Entering firms	...	8.1	8.1	15.3
Exiting firms	7.2	...	-7.2	...
Broadcasting and telecommunications				
Surviving firms	97.2	97.7	0.5	31.3
Market-share gaining continuers	...	...	...	...
Market-share losing continuers	...	...	...	...
Entering and Exiting firms				
Entering firms	...	2.3	2.3	5.1
Exiting firms	2.8	...	-2.8	...
Business services				
Surviving firms	78.9	72.6	-6.3	46.5
Market-share gaining continuers	21.7	41.8	20.1	...
Market-share losing continuers	57.2	30.8	-26.4	...
Entering and Exiting firms				
Entering firms	...	27.4	27.4	48.5
Exiting firms	21.1	...	-21.1	...
Financial services				
Surviving firms	88.8	95.4	6.6	29.8
Market-share gaining continuers	47.4	65.6	18.2	...
Market-share losing continuers	41.4	29.8	-11.6	...
Entering and Exiting firms				
Entering firms	...	4.5	4.5	15.7
Exiting firms	11.2	...	-11.2	...

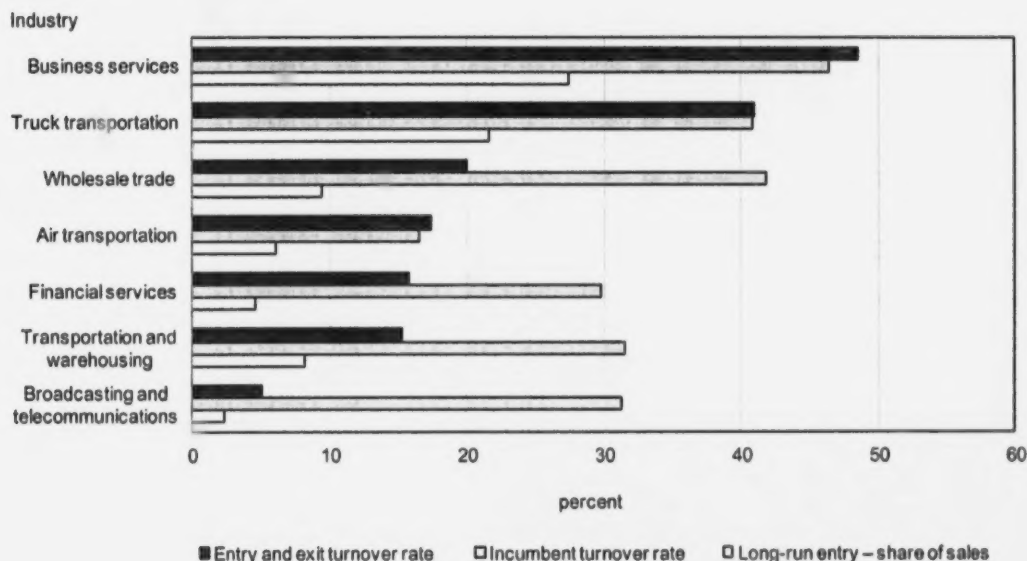
Notes: Authors' calculations from T2-LEAP file. Gains and losses in market share for entrants and exiters differ from those in Table 6 since the estimates in Table 6 use average sales of incumbents over the period rather than sales at the beginning and end of the period, which are used here to calculate market shares.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

The long-term turnover rates for continuing firms and for entrants and exiters are presented in Chart 9. In each case, the turnover rate is defined as the sum of the absolute values of market-share gains and losses of firms between 2000 and 2007—for incumbents, and entrants and exiters calculated separately. Industries are ranked from smallest to largest on the basis of the long-run entry rate using the share of sales to measure intensity. The long-run entry-and-exit turnover rate is lowest in broadcasting and telecommunications at around 5%, increases in transportation and warehousing, financial services, and air transportation to around 15% and then jumps to over 40% in truck transportation and business services.

The differences in the rate of turnover across industries in the incumbent sector generally follows the entry-and-exit turnover rate—from a low of around 30% in broadcasting and telecommunications, transportation and warehousing and financial services to over 40% in wholesale trade, truck transportation and business services. Air transportation has the lowest turnover rate among incumbents.

Chart 9
Incumbent turnover, entry and exit turnover, and long-run entry (sales)
in services industries



Competition occurs not only within the group of incumbents and within the group of newly created firms who are replacing exiting firms. Competition also takes place between these two groups. Sometimes, this process leads incumbents to increase their market share. In other cases, the entering and exiting group gains market share on balance relative to the leading firms.

An examination of the cross-industry differences in these patterns reveals additional differences in the nature of competition at the industry level. The extent to which entrants/exiters gain market share from incumbents, or whether the reverse is occurring, or whether the net turnover balance in each sector is approximately zero, provides evidence on whether incumbents are becoming more dominant or whether they are gradually being replaced by new players.

Surviving firms in broadcasting and telecommunications held over 97% of market share throughout the 2000-to-2007 period. Entrants in this industry gained only 2% of the total market share in the sector, the smallest amount for entrants of all the industries examined here. This is consistent with the fact that entrants are much less productive than incumbents in this industry. Moreover, although entry rates are higher when measured in terms of the percentage of new firms, entrants are relatively small whether measured in terms of output, assets or employment. In this sector, the gains in market share for entrants offset the losses in market share of exiters; this suggests that marginal firms are replacing similar entities—with little impact on the market share of incumbents, which is relatively constant over the period.

There is a different replacement process in the wholesale trade sector, in the air transportation industry and in financial services. In these industries, gains in market share in continuing firms come partially from incumbents that lost market share and also from firms that exited the industry. In financial services, the gain in market share of surviving firms is particularly high from 2000 to 2007, some 15%. Wholesale trade experiences the least net gain by incumbents—only 1.2 percentage points. Air transportation and financial services are industries that are composed of large firms that have scale economies, and incumbents here are on balance increasing their market share. New firms in all three industries are not as productive as incumbents.

The replacement process in truck transportation, transportation and warehousing, and business services favours entrants over incumbents. Incumbents lose market share on balance, while entrants gain more market share than is lost by exiters. In these industries, entrants are also more productive than surviving firms. In both truck transportation and business services, the strength of entry is demonstrated by the fact that entrants gain more market share than do continuing incumbents. In truck transportation, the continuing firms that increased market share acquired an additional 19 percentage points in market share over the 2000-to-2007 period. Entering firms captured 22 percentage points. In business services, entrants gained 27 percentage points. The continuing firms that increased market share gained an additional 20 percentage points over the period.

Three broad patterns are discernible in the industries being studied. In the first set, entrants in the industry gain little market share and most of the shifts in market share take place between incumbents. In these industries, entrants are not as productive as incumbents. Entry rates are lowest in this sector. In the second set, net entry is negative: new firms are not sufficiently dynamic to offset the losses experienced by firms that are closing down and the incumbent sector grows in size. In this group of industries, entrants are less productive than incumbents, but more productive than exiters. Entry is higher here than in the first set. In the third set, entrants in the industry gain substantial market share at the expense of exiters but they also displace incumbents. In this case, entrants are more productive than both incumbents and exiters. Entry is highest in this set.

6 Contribution of firm turnover to productivity growth in the services industries

This section examines the contribution of firm turnover to productivity growth in the services industries.

Several different but related methods have been used to decompose productivity growth into its components. Most studies related to firm dynamics and productivity growth start by noting that the productivity of an industry is the weighted sum of the productivity of individual firms:

$$P_t = \sum_i s_{it} p_{it} \quad (3)$$

where P_t is industry productivity, s_{it} is the share of firm i in total output or employment of an industry and p_{it} is firm i 's labour productivity. Changes in productivity will occur both when firms improve productivity and as employment share shifts across firms with different productivity levels. Changes in employment shares can take place as new firms enter or exit the industry, but they can also occur among continuing firms as some firms grow and others decline in relative terms. The latter can result from a shift of employment from firms that are more productive to firms that are less productive.

The contribution of firm growth and decline is calculated by decomposing Equation (3). A decomposition proposed by Griliches and Regev (1995) breaks down the change in aggregate productivity between $t-k$ and t as:

$$\Delta P_t = \sum_{i \in C} \bar{s}_i \Delta p_{it} + \sum_{i \in C} \Delta s_i (\bar{p}_i - \bar{P}) + \sum_{i \in N} s_{it} (\bar{p}_i - \bar{P}) - \sum_{i \in X} s_{it-k} (\bar{p}_{i-k} - \bar{P}) \quad (4)$$

where a bar over a variable indicates the average of the variable over the base and end years, C denotes the set of continuing firms in the period, N denotes the set of entering firms, and X denotes the set of exiting firms. The first term is referred to as the within-firm effect, that is, the contribution to overall productivity growth of growth within the surviving firms. It will be positive if incumbents are on average improving their productivity; it will be negative if technical change is leaving incumbents behind. The second term is the between-firm effect and captures the outcome of the reallocation of output and inputs among surviving firms. It will be positive if the firms that gain employment share have above-average productivity. The third and fourth terms are identified as measuring the contribution of entering and exiting firms respectively. The last three terms, taken together, measure the contribution of firm turnover to aggregate productivity growth. Here, the contribution of entering and exiting firms to overall productivity growth is based on a comparison with an average firm in the period. Entrants contribute positively as long as entering firms are more productive than the average firm and exiting firms are less productive than the average firm. The net effect of entry and exit is sometimes taken as the sum of these two terms.

The appropriateness of a particular decomposition like Equation (4) depends on the assumptions contained in the underlying formula regarding the replacement process. For purposes of calculating the contribution of entry to productivity growth, the Griliches and Regev (1995) decomposition assumes that an entrant replaces an average firm and an exitor is replaced by an average firm. While a useful construct for some purposes, it may hide the true gains from competition associated with entry—especially when the pattern of replacement differs from this assumption.

As demonstrated in Section 5, the replacement process can differ across industries in the same sector. In manufacturing, previous studies have shown that entrants basically replace exiters (Baldwin and Rafiquzzaman 1995; Baldwin and Gu 2006). These authors used a variant of the Griliches and Regev (1995) decomposition that recognizes this replacement process, by comparing the productivity of entrants to that of an exiting firm rather than to that of an average firm in order to measure the impact of entry. If entrants replace exiting firms, the effect of entry cannot be disassociated from the exit process. Only the net effect of entrants can be measured. In this case, the decomposition is:

$$\Delta P_t = \sum_{i \in C} \bar{s}_i \Delta p_{it} + \sum_{i \in C} \Delta s_i (\bar{p}_i - P_X) + \sum_{i \in N} s_{it} (p_{it} - P_X) - \sum_{i \in X} s_{it-k} (p_{it-k} - P_X) \quad (5)$$

where P_X is the base-year productivity of exiting firms. By construction, the fourth term in the decomposition is equal to zero. The third term measures the contribution of entry and exit (or net entry) to overall productivity growth when it is recognized that the contribution of the two processes cannot be separated—and captures the joint effect of turnover.

Baldwin and Gu (2008) noted that this decomposition can be further adapted to recognize other replacement processes—such as the one that occurs in the Canadian retail trade sector—since the share of entrants in this sector is much larger than the share of exiters. Entrants here gain market share from incumbents that are in decline. In the services industries examined here, entrants in the truck transportation, transportation and warehousing, and business services industries also take market share from incumbents. To accord with this replacement process, the following decomposition can be used—see Baldwin and Gu (2008):

$$\Delta P_t = \sum_{i \in C} \bar{s}_i \Delta p_{it} + \sum_{i \in C} \Delta s_i (\bar{p}_i - P_D) + \sum_{i \in N} s_{it} (p_{it} - P_D) - \sum_{i \in X} s_{it-k} (p_{it-k} - P_D) \quad (6)$$

where P_D is the base-year productivity of continuing firms that contracted over a period. The third and fourth terms together measure the contribution of entrants displacing exiters and declining incumbents to overall productivity growth. The second term captures the effects of the replacement process within incumbents where the growers are assumed to replace those in decline. Equation (6) can be rewritten as:

$$\Delta P_t = \sum_{i \in C} \bar{s}_i \Delta p_{it} + \sum_{i \in C} \Delta s_i (\bar{p}_i - P_D) + \sum_{i \in X} s_{it-k} (P_N - p_{it-k}) + (S_N - S_X)(P_N - P_D) \quad (7)$$

where P_N is the end-year productivity of entering firms, S_N is the share of entering firms at the end of the period, and S_X is the share of exiting firms at the beginning of the period. The third term in the equation is the productivity difference between entrants and exiters, multiplied by the share of exiters. It measures the contribution of entrants displacing exiters. The fourth term in the equation is the productivity difference between entrants and declining incumbents, multiplied by the share of output and employment that entrants gained from declining incumbents. It is the contribution to overall productivity growth of entrants displacing incumbents. The sum of the third and fourth terms will be referred to here as the overall effect of entry that arises from the displacement of both exiters and declining incumbents.

When the share of entrants (S_N) is equal to the share of exiters (S_X), as is the case for the manufacturing sector, Decomposition (7) becomes Decomposition (5). This decomposition is used here for truck transportation, transportation and warehousing, broadcasting and telecommunications, and business services.

Wholesale trade, air transportation, and financial services require a different decomposition since here continuing firms gained market share not only from incumbents that lost market share, but also from firms that exited the industry. In this case, Decomposition (5) or (7) would not accord with this replacement process. To account for growing incumbents displacing exiters, Equation (7) needs to be modified to:

$$\Delta P_i = \sum_{i \in C} \bar{s}_i \Delta p_{ii} + \sum_{i \in C} \Delta s_i (\bar{p}_i - P_G) + \sum_{i \in N} s_{ii} (p_{ii} - P_X) + (S_X - S_N)(P_G - P_X) \quad (8)$$

where P_G is the base-year productivity of continuing firms that expanded over a period. The third term still accounts for the contribution of entrants displacing exiters to overall productivity growth. The fourth term in the equation is the productivity difference between gaining incumbents and exiters, multiplied by the share of output and employment that incumbents gained from exiters. It is interpreted here as the contribution to overall productivity growth of incumbents that gain market share by displacing exiters. The sum of the third and fourth terms will be referred to here as the overall effect of exit that arises from both entry and growing incumbents.

The next section applies the decomposition from Equation (7) to transportation and warehousing, truck transportation, broadcasting and telecommunications, and business services. The decomposition from Equation (8) is applied to wholesale trade, air transportation, and financial services. Both decompositions are more likely than the Griliches and Regev (1995) decomposition to capture the particular nuances of the replacement process at work. Nevertheless, in order to allow comparisons to other studies that may have used a variant of the Griliches and Regev (1995) decomposition, the contribution to overall productivity growth for each industry is also calculated using this decomposition (Equation [4]). It is worth emphasizing that interpretations of each of these formulae need to take into account the pattern of turnover (whether the process appears to be one where new firms are replacing old ones or whether exits are just part of a restructuring where incumbents are disappearing even when there is no entry).

6.1 Empirical evidence for the services industries

In this section, all four-digit industries are treated as belonging to one sector—that is, the shares of individual firms are calculated relative to the overall sector. It is possible to calculate the impact of firm turnover within each four-digit industry separately within wholesale trade, business services, and financial services. The next section will present the results for the four-digit industries within these three sectors. This will make it possible to examine how the results differ across industries within each sector.

The decompositions of labour productivity growth for each industry are reported in Tables 13 and 14, where Table 13 contains the decompositions for truck transportation, transportation and warehousing, business services, and broadcasting and telecommunications and Table 14, for wholesale trade, air transportation, and financial services. Each cell in the table contains the percentage-point contribution to total growth from each component of the decomposition.

Table 13

Decomposition of labour productivity growth in services industries,¹ 2000 to 2007

	Within-firm effect	Between-firm effect	Net entry ²	Entry	Exit	Entry displacing exit	Entrants displacing decliners	Overall productivity growth in the period
	percentage points					percent		
Truck transportation	...	...	...	...	...	...	...	3.0
Griliches and Regev decomposition	-3.7	2.0	4.6	2.9	1.7	...	...	...
Baldwin and Gu decomposition	-3.7	2.0	4.6	...	...	4.8	-0.3	...
Transportation and warehousing	...	...	...	...	...	...	...	1.0
Griliches and Regev decomposition	-3.9	4.5	0.4	0.4	0.0	...	...	...
Baldwin and Gu decomposition	-3.9	4.5	0.5	...	...	0.4	0.1	...
Broadcasting and telecommunications	...	...	...	...	...	...	...	10.0
Griliches and Regev decomposition	7.3	0.2	2.1	-2.8	4.9	...	...	...
Baldwin and Gu decomposition	7.3	-0.2	2.4	...	...	0.8	1.6	...
Business services	...	...	...	...	...	...	...	9.0
Griliches and Regev decomposition	5.2	0.0	3.7	1.4	2.3	...	...	...
Baldwin and Gu decomposition	5.2	0.2	3.4	...	...	3.4	0.0	...

1. Excluding wholesale trade, air transportation and financial services.

2. Net entry is obtained in the Griliches and Regev (1995) decomposition while in the Baldwin and Gu (2008) decomposition, net entry is obtained from the sum of terms 3 and 4 of Decomposition 7.

Notes: Authors' calculations from T2-LEAP file. The numbers are employment weighted and represent the percentage-point contribution to overall change.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

In an industry or sector where entrants gain little market share, most of the labour productivity growth should be accounted for by continuing firms—either by within-incumbent productivity growth or by shifts within the sector. Indeed, in broadcasting and telecommunications, the productivity growth of continuing firms is the predominant source of labour productivity growth. However, net entry still has a positive impact in this industry, though less than in other industries where entry is more intense. Approximately 20% of total labour productivity growth in broadcasting and telecommunications is due to entry and exit. The between-firm effect is close to zero: the effect of employment shifts from less productive firms to more productive continuing firms over the period had no impact on overall productivity growth.

For the industries where entrants displace exiters and losing incumbents (business services, truck transportation, and transportation and warehousing), and are more productive than incumbents, entry contributes, often quite significantly, but the organic within-firm growth success of incumbents differs across sectors.

In business services, productivity growth in incumbents is considerable and, therefore, the within-firm effect is an important source of labour productivity growth. In addition, the entry-and-exit process had a strong impact on labour productivity growth over the 2000-to-2007 period, contributing about 40% of overall labour productivity growth. The between-firm effect is negligible: this indicates that shifts in employment from less productive to more productive continuing firms make little contribution to labour productivity growth in the sector.

In contrast to business services, within-firm productivity growth in truck transportation is negative. Here, technological conditions led to declines in the productivity of incumbents, on average. This can occur for a number of reasons—the development of excess capacity as a result of competition, a failure to keep up with investment, or other management problems. However, as was the case with business services, entry and exit contributed significantly. In light of the negligible within-firm performance in this sector, entry and exit provide the

predominant source of labour productivity growth here—over 60%. Employment shifts within the incumbent sector also had a positive impact on labour productivity growth.

In the case of transportation and warehousing, overall growth in labour productivity was low over the period and within-firm growth was negative, as it was in truck transportation. The predominant source of labour productivity growth comes from shifts in employment from less productive to more productive continuing firms. While the contribution of firm entry and exit is positive, it is small because there is little difference in the productivity of entrants and exiters. Turnover matters here for productivity growth, but it is the shifts within the continuing sector, not the shifts due to the replacement of exiters with entrants, that are more important. That the impact of entry is less here than in the other two industries that are in this group accords with the lower importance of entry herein relative to the other two sectors and the small difference in productivity between entrants and exiters.

Table 14

Decomposition of labour productivity growth in wholesale trade, air transportation and financial services, 2000 to 2007

	Within-firm effect	Between-firm effect	Net exit ¹	Entry	Exit	Entry displacing exit	Gainers displacing exiters	Overall productivity growth in the period
								percentage points
								percent
Wholesale trade	...	...	...	...	...	...	...	10.0
Griliches and Regev decomposition	5.2	1.7	2.8	-0.8	3.6	...	...	...
Decomposition 8	5.2	2.0	2.6	...	...	2.0	0.6	...
Air transportation	...	...	...	...	...	...	...	40.0
Griliches and Regev decomposition	44.5	-4.9	0.1	2.1	-2.0	...	...	...
Decomposition 8	44.5	-3.7	-1.0	...	...	0.8	-1.8	...
Finance and insurance	...	...	...	...	...	...	...	3.0
Griliches and Regev decomposition	-2.4	1.6	3.6	-4.0	7.6	...	...	...
Decomposition 8	-2.4	0.9	4.2	...	...	-0.5	4.7	...

1. Net entry is obtained in the Griliches and Regev (1995) decomposition while net exit is obtained in Decomposition 8.

Notes: Authors' calculations from T2-LEAP file. The numbers are employment weighted and represent the percentage-point contribution to overall change.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

In summary, in the group of firms where entry is high and these firms replace exiters as well as declining incumbents (truck transportation, business services, and transportation and warehousing), turnover from entry makes a major contribution to overall productivity growth. In two of these industries (truck transportation, and transportation and warehousing), turnover within the incumbent sector also makes a significant contribution. As was demonstrated previously, turnover within the incumbent sector is generally higher where turnover due to entry and exit is higher. Turnover from both sources together generates productivity growth in all three of the industries in this group.

In the industries where growing incumbents displace exiters (air transportation, financial services, and wholesale trade—industries where entry is a little less important), the predominant sources of labour productivity growth also differ (Table 14), partially because the entry conditions differ so markedly across the three industries that fall in this group.

In the wholesale trade sector, the majority of labour productivity growth is due to growth within an average firm in the sector. The contribution of the within-plant component accounted for about 50% of labour productivity growth. However, this industry had substantial turnover as a result of shifting market share within incumbents and as a result of entry and exit. Both these

forms of turnover had a positive impact on labour productivity growth—18% coming from shifts within incumbents and 30% from entry and exit. The effect of growing incumbents displacing exiters accounts for 6% of labour productivity growth.

As was the case with the wholesale trade sector, the predominant source of labour productivity growth in air transportation over the 2000-to-2007 period is due to growth within an average firm in the sector. However, here entry is relatively unimportant quantitatively and contributes little to productivity growth.

Finally, for the financial services sector, the two sources of labour productivity growth over the 2000-to-2007 period are due to turnover—from the shift of resources from less productive to more productive incumbent firms. And while entry is less important here than in many other services industries, there is a substantial exit rate of less productive firms that is an important contributor to productivity growth—though in this industry, exit is driven entirely by growing incumbents rather than by new firms.

6.2 Empirical evidence for wholesale trade, business services and financial services at the industry level

This section examines the contribution of firm turnover within the wholesale trade, business services, and financial services sectors, assuming that entrants replace firms within each industry rather than across industries. The Baldwin and Gu (Equation [7]) decompositions are used in each case. The decompositions for the growth in labour productivity over the 2000-to-2007 period are presented in Tables 15, 16 and 17, for wholesale trade, business services, and financial services, respectively.

In the wholesale trade sector, entry and exit make a positive contribution to labour productivity growth in 23 out of the 25 wholesale trade industries. In two of these cases, entry and exit are the predominant source of labour productivity growth. The industry-level results confirm the findings of the previous section: firm entry and exit are an important source of productivity growth in this sector. It is also the case that turnover within incumbents in the wholesale trade sector matters: for about half of the industries, firm turnover that comes from restructuring in existing firms (between-firm effect) accounts for some of labour productivity growth.

In business services, in cases where labour productivity growth is positive, entry and exit, along with growing productivity growth for continuing firms, make a positive contribution to this growth. In many of these cases, the between-firm effect is actually negative. The industry-level results for business services confirm that entry and exit have a positive impact on labour productivity growth.

In financial services, the effect of entry and exit on labour productivity growth is variable. In industries where labour productivity growth is positive, productivity growth of continuing firms accounts for the largest contribution to productivity growth. The contributions of net entry vary from negative to positive and are not consistent across industries. The aggregate results accord only with those in a subset of industries.

Table 15

Decomposition of labour productivity growth for wholesale trade industries at the NAICS four-digit level, 2000 to 2007

Industry	NAICS code	Firm population in 2007	Overall productivity growth	Within-firm contribution	Between-firm contribution	Contribution of net entry
	number	number	percent	percentage points		
Farm product wholesaler-distributors	4111	675	26.1	7.9	8.2	9.9
Petroleum product wholesaler-distributors	4121	637	24.8	9.5	7.6	7.7
Food wholesaler-distributors	4131	4,688	21.8	17.5	-0.2	4.5
Beverage wholesaler-distributors	4132	452	8.8	-1.2	5.1	4.9
Textile, clothing and footwear wholesaler-distributors	4141	2,146	1.7	-10.6	8.6	3.7
Home entertainment equipment and household appliance wholesaler-distributors	4142	430	-9.0	-11.3	3.4	-1.1
Home furnishings wholesaler-distributors	4143	1,117	13.0	3.9	2.6	6.5
Personal goods wholesaler-distributors	4144	1,980	-3.0	0.3	-0.6	-2.7
Pharmaceuticals, toiletries, cosmetics and sundries wholesaler-distributors	4145	1,129	36.3	34.5	0.3	1.4
Motor vehicle wholesaler-distributors	4151	831	-1.0	-8.1	6.2	0.9
New motor vehicle parts and accessories wholesaler-distributors	4152	1,779	29.2	24.6	1.7	2.9
Used motor vehicle parts and accessories wholesaler-distributors	4153	352	11.6	-1.7	8.7	4.7
Electrical, plumbing, heating, and air conditioning equipment and supplies wholesaler-distributors	4161	1,924	18.8	19.6	-1.2	0.4
Metal services centres	4162	677	18.3	13.5	1.7	3.0
Lumber, millwork, hardware and other building supplies wholesaler-distributors	4163	3,382	13.4	9.1	0.6	3.7
Farm, lawn and garden machinery and equipment wholesaler-distributors	4171	1,296	20.7	11.3	4.7	4.6
Construction, forestry, mining and industrial machinery, equipment and supplies wholesaler-distributors	4172	3,827	8.6	2.6	5.0	1.1
Computer and communications equipment and supplies wholesaler-distributors	4173	2,096	-23.3	-21.5	-8.6	6.8
Other machinery, equipment and supplies wholesaler-distributors	4179	4,145	16.6	8.4	4.6	3.7
Recyclable material wholesaler-distributors	4181	1,128	36.0	22.2	5.5	8.2
Paper, paper product and disposable plastic product wholesaler-distributors	4182	754	18.0	10.5	4.2	3.3
Agricultural supplies wholesaler-distributors	4183	728	5.4	8.6	-5.7	2.4
Chemical (except agricultural) and allied products wholesaler-distributors	4184	849	-16.1	-15.3	-0.8	0.0
Other miscellaneous wholesaler-distributors	4189	4,127	11.5	-1.4	9.7	3.2
Wholesale agents and brokers	4191	4,690	-7.0	-6.9	-2.4	2.3
Simple average, wholesale trade	...	...	11.1	5.2	2.8	3.1

Notes: Authors' calculations from T2-LEAP file. The results are based on the decomposition method of Baldwin and Gu (2008). The simple average calculated above may differ from the average for the total wholesale trade sector presented in Table 3. This difference can be attributed to the employment shares used. These shares are used to calculate the weighted average of labour productivity across industries. "NAICS" stands for "North American Industry Classification System."

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 16
Decomposition of labour productivity growth for business services industries at the NAICS four-digit level, 2000 to 2007

Industry	NAICS code	Firm population in 2007	Overall productivity growth	Within-firm contribution	Between-firm contribution	Contribution of net entry
	number	number	percent	percentage points		
Legal services	5411	6,987	37.1	14.9	-11.4	33.5
Accounting, tax preparation, bookkeeping and payroll services	5412	9,169	12.7	-2.8	3.9	11.7
Architectural, engineering and related services	5413	17,082	25.1	17.3	4.4	3.5
Specialized design services	5414	4,249	4.3	7.1	-3.0	0.2
Computer systems design and related services	5415	23,722	8.6	3.8	-0.1	4.9
Management, scientific and technical consulting services	5416	25,373	21.6	12.5	-1.3	10.5
Scientific research and development services	5417	2,040	-25.0	-19.1	-1.2	-4.8
Advertising and related services	5418	4,270	2.4	-5.8	4.7	3.4
Other professional, scientific and technical services	5419	7,658	2.2	-2.7	-0.4	5.3
Simple average, business services	...	...	9.9	2.8	-0.5	7.6

Notes: Authors' calculations from T2-LEAP file. The results are based on the decomposition method of Baldwin and Gu (2008). The simple average calculated above may differ from the average for the total business services sector presented in Table 3. This can be attributed to the employment shares used. These shares are used to calculate the weighted average of labour productivity across industries. "NAICS" stands for "North American Industry Classification System."

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table 17
Decomposition of labour productivity growth for financial services industries at the NAICS four-digit level, 2000 to 2007

Industry	NAICS ¹ code	Firm population in 2007	Overall productivity growth	Within-firm contribution	Between-firm contribution	Contribution of net entry
	number	number	percent	percentage points		
Depository credit intermediation	5221	1,088	-4.7	-5.2	-1.2	1.7
Non-depository credit intermediation	5222	1,582	4.6	9.2	1.6	-6.2
Activities related to credit intermediation	5223	1,144	-31.0	-45.3	24.7	-10.4
Securities and commodity contracts intermediation and brokerage	5231	1,143	32.4	48.2	-18.3	2.5
Other financial investment activities	5239	13,437	3.1	-12.0	10.0	5.1
Insurance carriers	5241	266	10.0	-21.6	17.0	14.7
Agencies, brokerages and other insurance-related activities	5242	7,353	46.9	47.4	-3.4	2.8
Simple average, financial services	...	...	16.4	20.0	-1.6	-1.9

1. NAICS stands for North American Industry Classification System.

Notes: Authors' calculations from T2-LEAP file. The results are based on the decomposition method of Baldwin and Gu (2008). The simple average calculated above may differ from the average for the total financial services sector presented in Table 3. This can be attributed to the employment shares used. These shares are used to calculate the weighted average of labour productivity across industries. "NAICS" stands for "North American Industry Classification System."

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

7 Conclusion

The literature on the subject of competition has provided growing evidence on the link between firm turnover and productivity growth. While most studies have focused on the manufacturing sector and more recently on the retail trade sector, this paper contributes to the literature by examining firm turnover and productivity growth in various other services industries in Canada.

Two sets of conclusions emerge from this study. The first has to do with the general patterns that complement earlier work on Canadian manufacturing and retailing. The general findings that emerge are the following:

There are fewer differences across industries with respect to exit rates than there are with regard to entry rates. This suggests a pattern of adjustment that is the result of a relatively constant percentage of firms becoming uncompetitive each year whereby resources are reallocated to those industries in which entry opportunities are most favourable, as a result of either demand and regulatory conditions or market structure.

The effectiveness of entry (measured as market share captured) differs considerably more across industries than does its intensity (measured in terms of the percentage of new firms experimenting with entry at any point in time).

The effectiveness of entry is closely related to entry conditions that facilitate entry on a relatively large scale and at high relative productivity. When entry conditions permit or encourage entry at a relatively large size, both short- and long-run entry rates are larger when calculated on the basis of metrics related to market share or employment share.

The failure process within entrants (as measured by failure or hazard curves) is similar across industries. The percentage of entrants remaining after six years is quite similar in the various services industries. The failure process does differ in terms of the impact of suboptimal size and productivity on the probability of failure. In industries where entrants are relatively large at birth, the penalty for entry at suboptimal size or productivity is higher.

There is very little increase in an average entrant's relative productivity after birth.

Entrants start with a size disadvantage, experience higher failure rates that are inversely proportional to birth size and grow more quickly when they have less of a size disadvantage at birth.

Industries with higher turnover from entry and exit generally have higher turnover within the incumbent sector.

The extent to which incumbents as a group gain market share at the expense of entrants and exiters differs across industries, but the differences are not large.

The entry-and-exit process that replaces less productive exiters with more productive entrants contributes a substantial proportion of overall productivity growth in industries where entry conditions facilitate higher effective entry.

Even when new, more productive entrants are not emerging to replace less productive existing firms that are failing, gains in productivity can occur when restructuring leads to the exit of less productive businesses. Productivity growth comes in some industries from a dynamic growth process that is characterized by new firms replacing dying, less productive exiters and in other industries from the least productive firms exiting as a result of competition from incumbents.

Turnover within the incumbent sector also contributes to productivity growth, but less so than does entry and exit.

Productivity growth also comes from organic improvements within incumbents—that is, from growth within existing firms. However, this source is not always positive. There are some industries where productivity of an average incumbent falls—perhaps because the industry is adjusting to a decline in demand, or because technology is changing and incumbents are not adapting well.

The second set of conclusions that emerges relates to how the services industries examined here fit into this overall pattern. These are the specific insights emerging from the services industries studied here—business services, truck transportation, wholesale, transportation and warehousing, air transportation, financial services, and broadcasting and telecommunications.

Earlier work found large differences between the manufacturing and the retail sectors. The latter had much higher effective entry rates (measured in terms of market share) because the relative size of entrants was higher. And the contribution of entry to productivity was much higher for that reason. Of interest here is whether the other services industries resemble the retail sector more than they do manufacturing or whether there is a broad spectrum of models in the services sector.

Over the 2000-to-2007 period, long-term entry rates, calculated using the share of firms, are highest in business services (60%) and truck transportation (57%) and lowest in air transportation (35%). Exit rates range from 35% in wholesale trade to 48% in broadcasting and telecommunications. Wholesale trade is the industry that has the lowest rates. There are therefore large differences across the services sector in terms of turnover intensity from entry and exit.

The cross-industry differences become larger when entry is measured in terms of market share captured because of differences in the relative size of successful entrants. At birth, entrants are smaller than incumbents in all industries, but their relative size is largest in business services and truck transportation. Entrants in business services are almost 60% as large as surviving firms, followed by truck transportation at 52%, with wholesaling and broadcasting and telecommunications around 32%. These differences magnify the lead that business services and truck transportation have with respect to effective entry rates. The 2000-to-2007 effective entry rate in these two industries is over 20%, while it is less than 10% in the remainder.

In truck transportation and business services, entrants at birth are more productive than incumbents. These industries then most resemble the retail sector both with regards to their higher effective entry rate, the large relative size of entrants, their high relative productivity and large differences between the relative productivity of entrants and exiters. Wholesaling along with transportation and warehousing come next with regards to their entry effectiveness. The entrants in these two industries have either relatively lower productivity or less of a productivity advantage over exiters than those in the first two service industries. Broadcasting and telecommunications, air transportation, and financial services follow with the lowest effective entry rates; entrants in these industries are relatively smaller and relatively less productive.

The survival pattern of entrants is similar across most services industries, and similar to the survival pattern of entrants in the manufacturing and retail trade sectors. Entrants that are larger and more productive are more likely to survive. These factors are particularly important in business services and wholesale trade. The exit rate of new firms in broadcasting and telecommunications is higher than that of new firms in the rest of the services group.

The replacement process varies across the industries examined in this paper. Most of the shifts in market share in the broadcasting and telecommunications industry take place among incumbents. The intensity of entry, as measured by the percentage of firms that are new, is high in this industry, but entrants are much smaller and much less productive than surviving firms and effective entry is, therefore, less important.

In air transportation, wholesale trade, and financial services, incumbents gain market share at the expense of entrants and exiters, which leads to growth in market share in the incumbent group. These industries are characterized by large firms that benefit from scale economies.

The replacement process in truck transportation and business services most closely resembles the replacement process in the retail trade sector, where entrants gain a large proportion of market share from exiters as well as from incumbents. These entrants are more productive than both exiters and incumbents.

These are also the industries where turnover due to entry and exit contributes substantially to productivity growth—though this source was not as dominant as in retailing, where entry and exit accounted for all of productivity growth. Firm turnover positively contributes to overall labour productivity growth in all industries. In those industries where entry rates are highest, such as truck transportation and business services, the entry process contributes significantly to productivity growth. Shifts in employment shares within the incumbent sector also contribute positively to productivity growth in some industries (truck transportation, transportation and warehousing, and wholesaling), but they are generally not as important as the contribution from entry and exit.

The importance of organic growth within incumbents is an important source of productivity growth in wholesale trade, air transportation, broadcasting and telecommunications, and business services. However, incumbents in truck transportation experience negative productivity growth.

These findings confirm that there is a broad spectrum of patterns in firm turnover and in its effect on productivity growth across the services industries studied here. The business services and truck transportation industries most resemble the retail trade sector in terms of relative importance of entry and its contribution to productivity growth. However, even here, entry does not contribute the same amount to total productivity growth. Wholesale trade follows but has less turnover and a smaller contribution of this turnover to productivity growth than is found in business services and truck transportation. Elsewhere, in air transportation, financial services and broadcasting and telecommunications, different dynamics are at work, and there is generally less turnover.

Appendix

Table A1
Hazard rate of firm exits in services industries, regression results

Variable	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Employment in log	-0.24	6.42	-0.24	20.57	-0.36	15.50	-0.42	60.31	-0.33	18.43	-0.41	60.31
Relative multifactor productivity in log (1.40)	-0.06	1.01	-0.05	3.06	0.05	1.40	-0.13	10.14	0.10	0.39	-0.18	24.05
Binary variables for entry cohort												
2003	-0.14	1.00	-0.08	1.83	-0.22	3.17	-0.09	2.55	-0.13	2.99	-0.11	5.55
2004	-0.44	2.69	-0.16	3.49	-0.29	4.00	-0.20	5.54	-0.18	3.84	-0.16	7.55
2005	-0.31	1.85	-0.12	2.47	-0.25	3.40	-0.26	6.40	-0.23	4.94	-0.23	10.70
	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
Diagnostic statisitc												
Number of observations	671		9,515		3,834		14,355		9,678		44,716	
Log likelihood	-1,561		-27,340		-10,373		-45,817		-28,697		-161,558	

Notes: All regressions control for fixed effects for industries at the four-digit level of the North American Industry Classification System. Estimates are statistically significant at the 5% significance level.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table A2

Post-entry growth in relative multifactor productivity of new firms in services industries—using ordinary least squares

Variable	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Binary variables for the age of new firms												
1 year	...	...	...	...	...	...	...	...	...	...	...	...
2 years	0.012	0.190	0.013	0.650	-0.030	1.280	-0.016	1.250	0.007	0.650	-0.017	2.670
3 years	-0.051	0.720	-0.018	0.890	-0.037	1.580	-0.033	2.590	0.006	0.580	-0.030	4.720
4 years	-0.125	1.760	-0.027	1.200	-0.039	1.480	-0.035	2.470	0.002	0.180	-0.034	4.860
5 years	-0.145	1.810	-0.051	1.990	-0.072	2.120	-0.058	3.530	-0.002	0.100	-0.036	4.330
6 years	-0.252	2.340	-0.117	3.480	-0.095	2.560	-0.103	4.700	-0.036	1.910	-0.054	5.110
	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
Relative labour productivity growth rate at birth ¹		1.646		1.462		1.125		0.705		1.044		1.092
Diagnostic statistic												
Number of observations		1,811		27,549		10,937		40,904		27,432		124,894
R squared		0.06		0.14		0.18		0.02		0.008		0.03

1. These results are also shown in Table 7.

Notes: All regressions control for fixed effects for industries at the four-digit level of the North American Industry Classification System and entry cohort. The weighted regression for labour productivity uses average labour units as weights, and the weighted regression for multifactor productivity uses sales as weights.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table A3

Post-entry growth in multifactor productivity of new firms in services industries—using weighted least squares

Variable	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Binary variables for the age of new firms												
1 year	...	...	...	...	...	...	...	...	...	...	...	...
2 years	0.058	0.350	-0.054	0.450	-0.035	0.510	-0.051	1.640	-0.175	0.680	-0.053	0.780
3 years	0.086	0.480	-0.095	0.810	-0.058	0.960	-0.065	1.960	-0.339	1.630	-0.112	1.680
4 years	0.203	0.690	-0.187	1.760	-0.052	0.860	-0.073	1.520	-0.410	1.750	-0.078	1.240
5 years	0.179	0.850	-0.201	1.930	-0.098	1.570	-0.059	1.080	-0.486	1.840	-0.116	1.680
6 years	-0.023	0.090	-0.119	1.120	-0.121	1.330	-0.165	3.410	-0.667	2.080	-0.108	1.150
Diagnostic statistic												
Number of observations	1,811		27,549		10,937		40,904		27,432		124,894	
R squared	0.19		0.27		0.36		0.06		0.11		0.04	

Notes: All regressions control for fixed effects for industries at the four-digit level of the North American Industry Classification System and entry cohort. The weighted regression for labour productivity uses average labour units as weights, and the weighted regression for multifactor productivity uses sales as weights.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

Table A4

Post-entry growth in output of new firms in services industries—using weighted least squares

Variable	Broadcasting and telecommunications		Financial services		Transportation and warehousing		Wholesale trade		Truck transportation		Business services	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Binary variables for the age of new firms												
1 year	...	...	...	...	...	...	...	...	...	...	...	...
2 years	0.229	0.740	0.170	0.460	-0.326	1.010	0.115	1.200	-0.179	0.210	0.176	0.400
3 years	0.356	1.040	0.211	0.560	-0.251	0.730	0.212	2.120	-0.564	0.850	0.108	0.270
4 years	0.515	1.080	0.244	0.840	0.018	0.060	0.285	2.090	-0.614	0.820	0.205	0.450
5 years	0.755	1.710	0.478	1.510	-0.039	0.130	0.325	1.890	-0.733	0.880	0.303	0.520
6 years	0.546	0.960	0.399	1.230	0.041	0.110	0.317	1.610	-1.174	1.150	0.338	0.390
Diagnostic statistic												
Number of observations	1,811		27,549		10,937		40,904		27,432		124,894	
R squared	0.19		0.53		0.33		0.12		0.16		0.12	

Notes: All regressions control for fixed effects for industries at the four-digit level of the North American Industry Classification System and entry cohort. The weighted regression for output uses output as weights.

Sources: Statistics Canada, Longitudinal Employment Analysis Program database; and Canada Revenue Agency, Corporate Tax Statistical Universal File.

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